Railway Mechanical Engineer

VOLUME 100. NUMBER 5 — New York—May, 1926—Chicago — ESTABLISHED IN 1832

Volume 100 **Number 5**

Published Monthly by Simmons-Boardman Publishing Co., 30 Church St., New York, N. Y. Subscription price, United States, Canada and Mexico, $3.00 a year; foreign countries, $4.00 a year or, .17.0, through the London Office; single copies, 35c., or, 1.6d. Entered at New York, N. Y., as second-class matter.

Railway Mechanical Engineer

Volume 100 MAY, 1926 No. 5

Table of Contents

The June issue is the

ANNUAL SHOP EQUIPMENT NUMBER

Always good—This year better

PUBLISHED ON THE FIRST THURSDAY OF EVERY MONTH BY THE
SIMMONS-BOARDMAN PUBLISHING COMPANY

EDWARD A. SIMMONS, *President* HENRY LEE, *Vice-President and Treasurer*
L. B. SHERMAN, *Vice-President* SAMUEL O. DUNN, *Vice-President*
CECIL R. MILLS, *Vice-President* ROY V. WRIGHT, *Secretary*
30 Church Street, New York, N. Y.
F. H. THOMPSON, *Vice-President and Business Manager, Cleveland*

Chicago: 608 South Dearborn St. Cleveland: 6007 Euclid Ave.
Washington: 17th and H Sts., N. W. New Orleans: Mandeville, La.
San Francisco: 74 New Montgomery St.
London: 34 Victoria Street, Westminster, S. W. 1
Cable Address: Urasigmec, London

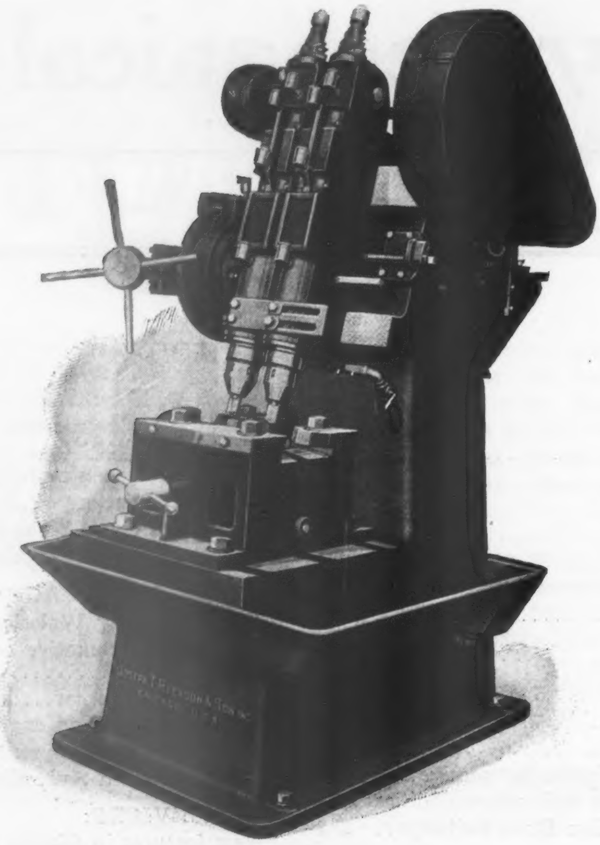
ROY V. WRIGHT, *Editor*
C. B. PECK, *Managing Editor*
E. L. WOODWARD, *Associate Editor* L. R. GURLEY, *Associate Editor*
MARION B. RICHARDSON, *Associate Editor* H. C. WILCOX, *Associate Editor*

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

Request for change of address should reach the New York office two weeks before the date of the issue with which it is to go into effect. It is difficult and often impossible to supply back numbers to replace those undelivered through failure to send advance notice. In sending us change of address, be sure to send us your old address as well as the new one.

Subscriptions, including the eight daily editions of the Railway Age published in June, in connection with the annual convention of the American Railway Association, Mechanical Division, payable in advance and postage free: United States, Canada and Mexico, $3.00 a year; foreign countries, not including daily editions of the Railway Age, $4.00. When paid through the London office, 34 Victoria Street, S. W. 1, 17s. 0d. Single copy 35 cents, or 1.6d.

The *Railway Mechanical Engineer* is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.).



The New Ryerson Inclined Rail Drill

Speeds Reclamation—Eliminates Turning Rails for the Drilling Operations

MANY thousands of dollars are being saved annually by railroads using Ryerson Rail Reclamation Equipment. Now with the addition of this new drill to the equipment further savings will be effected.

All heavy handling and turning of the rail during the reclamation process is eliminated. The holes are drilled while it lays on its side just as it comes from the saw and in the position which has been found to be the easiest for the workmen.

The drill is built with either two or three spindles inclined at an angle of 15 degrees, and has a range for drilling rails from 40 lb. up to the largest size. The spindles are controlled by a single capstan wheel. Turning the wheel in a clockwise direction, brings the drill rapidly to the rail; a slight further movement engages the feed. An adjustable knockout disengages the feed when the drills are through the rail. Thus, while hand controlled, it has the advantages of a highly automatic machine.

Let us send you a blue print showing the latest layout for a rail reclamation plant and also a complete description of this new equipment.

JOSEPH T. RYERSON & SON INC.

Established 1842

PLANTS: CHICAGO MILWAUKEE ST. LOUIS CINCINNATI DETROIT BUFFALO NEW YORK
BRANCH OFFICES: MINNEAPOLIS DENVER TULSA HOUSTON SAN FRANCISCO

RYERSON MACHINERY

Lathes	Punches	Small Tools	Horizontal Drills	Serpentine Shears
Drills	Shears	Friction Saws	Power Hammers	Hydraulic Machinery
Planers	Motors	Bevel Shears	Bending Rolls	Spring Shop Equipment
Shapers	Bulldozers	Milling Machines	Pneumatic Machinery	Flue Shop Equipment

Railway Mechanical Engineer

Vol. 100 May, 1926 No. 5

A thought on hot boxes

It was testified at a recent car foremen's meeting that some railroads do not even take the trouble to keep a record of hot boxes in freight service. While this statement may be somewhat exaggerated, as Mark Twain said about the report of his death, the question may well be raised if many railroads are not paying too little attention to the lubrication of freight equipment as compared to passenger equipment when the former is in reality the principal revenue earner. How otherwise is it possible to account for the fact that as many as two or perhaps three million miles per hot box is obtained in passenger train service, whereas 50,000 miles per hot box is an unusually good performance in freight service. Even making due allowance for the much greater speed and mileage of passenger cars, this would seem far too great a discrepancy in performance. Further evidence in the matter is afforded by a comparison of the respective lubrication costs. A large railroad system which is watching its mechanical department costs carefully reports a cost of 13.37 cents per 1,000 freight train car miles in 1925 as compared to 29.59 cents per 1,000 passenger train car miles in the same year. With the far greater number of cars and journals in the average freight train as compared with a passenger train, it is difficult to understand why the lubrication cost should be less than half on a 1,000 train-car-mile basis. It is well known that "familiarity breeds contempt." Have railroad men, through long custom, become used to hot boxes in freight service and, consequently, satisfied with a standard of performance considerably lower than that possible of attainment? Considering the dependance of railroads upon their earnings in freight service and the considerable cost of each individual hot box when all contributing factors are considered, it seems apparent that more time, thought and probably money, may profitably be expended in an attempt to minimize hot box troubles in this service.

Make records useful

The railroads employ many men and spend large sums of money annually in making records required for government reports and the information of the individual roads. While there is a feeling in some quarters that these records are unnecessarily voluminous and expensive to make, the fact remains that without accurate records efficient operation in any branch of railroad work is impossible. Records must be not only as accurate as possible, but a general, clear-cut understanding of what each individual record means is essential. Many railroad records are seriously deficient in the latter respect. Take, for example, the records of flue service. A number of expressions are used in connection with flue reports such as "flues renewed," "repaired," "re-set," "second-hand" and "worked over." What is the significance of these various terms? The fact is that they often mean different things at the various shops on the same railroad as well as on different roads, and the ambiguity and confusion is such that when a mechanical officer wants to trace the life of flues which may be safe-ended and re-set in a number of boilers in determining the seriousness of the pitting problem, he finds himself without definite, reliable information. It would seem that definite instructions should be issued from the general mechanical headquarters limiting these terms to the ones absolutely essential for record purposes and defining each one so that there will be a general understanding of what each means and thus prevent the possibility of including new flues, safe-ended flues and re-set flues all in the same tabulation with a result which is practically meaningless.

Another more or less ambiguous term which might be cited is the hot box. Almost anyone will say on first thought that they know what a hot box is, but, as a matter of fact, one road may consider a hot box to be any journal heating which causes a train delay, whereas another road may count only those hot boxes which occasion the setting out of cars. Accurate records in which the terms are clearly defined and generally understood are absolutely essential to efficient railroad operation. Without them supervising officers are unable to examine past performance intelligently and use it as a guide for present and future practice.

Mutual helpfulness pays

The heartiest co-operation should exist between the various department foremen in a railroad shop not only for the benefit of the railroad but for the mutual benefit of the foremen as well, and the success of a general shop supervising officer is measured in no small degree by his ability to promote this feeling of good will. The value of team work between department foremen is well known, being reflected in the attitude of the various groups of shop men towards each other, but unfortunately a high degree of team work is not always practiced. Lack of harmony and studied effort to help the other fellow in his work was plainly evident in a shop where the following incident occurred: A machinist and helper in the shoe and wedge gang needed liners in connection with their work of lining the shoes and wedges on a certain locomotive and after drawing a sketch to indicate the size and gage of the liners, a written order was obtained from the gang foreman and the helper took it to the boiler shop where the only power shear available was employed on important boiler work. As usual, the locomotive going out got the preference and the boiler foreman had to interrupt his work while the shear operator hunted up material of the right gage and sheared it to the size called for on the sketch. A short time later the machinist helper was back again with an-

other order for liners of different gage or for another class of engine. The boiler foreman rebelled, refusing to remove his work from the shears and as a consequence the helper stood around 15 or 20 min. waiting for the liners while his machinist back in the erecting shop was delayed accordingly. Complaint was made to the general foreman and hard feelings ensued between the two department foremen involved. A little advance study of the needs would have shown the erecting shop gang foreman in this case about how many shoe and wedge liners of a few standard sizes he would use in the course of a month, and, by placing the order well in advance, would have enabled the boiler foreman to turn them out quickly and at a time when the use of the power shears for this purpose would not interfere with the regular routine of boiler shop work. Many other examples of a similar nature might be cited. In general, railroad shop foremen see the advantage of pulling together in their work of maintaining cars and locomotives and where one foreman may be somewhat short-sighted in this respect it is the duty of the others to get together and bring pressure to bear, as diplomatically as possible but firmly, to show him the error of his ways.

Engine inspection methods

The prevalence of long engine runs has brought out in no uncertain terms the need of particularly careful inspection methods at initial terminals, a necessity also found vital to successful results in the campaigns for reduced engine failures being conducted by many roads. Considerable difference of opinion exists regarding the inspection methods which prove most effective and also regarding the kind of form best adapted to reporting defects. One railroad system has instituted a method whereby the inspector starts at the rear of the tender on the left side, going to the front and working back on the right side. He then goes under the tender, works underneath to the front of the engine, and finally inspects the cab and other overhead work. With this method, a laborer is provided to accompany the inspector, supply the necessary tools and material and enter the defects and repairs on the record card. Some master mechanics and experienced enginehouse foremen doubt the necessity of extended inspection after the locomotive is offered for service on the ground that it indicates improper initial inspection and repair work. On the other hand at least one or two roads maintain inspectors clothed with all the authority on those particular roads of federal inspectors and with full power to issue what practically amounts to a Form 5 for any locomotive which has been offered for service, with reportable defects not corrected.

The form of work report is highly important. A report containing detailed references to all the important locomotive and tender parts which must be inspected and checked has the double advantage of calling these parts to the attention of enginemen and engine inspectors and minimizing the amount of writing which must be done in making out reports. On the other hand, some master mechanics feel that the space allotted for each item on an extensive report of this kind is usually inadequate and the constant presence of specified items on a printed form leads the engine inspectors to take them as a matter of course and consequently the form loses some of its intended value as a reminder. Another possible disadvantage of the extensive report is that the engine inspectors by being required to check over a lengthy list of individual items have less time to give to actual inspection and locating defects.

Enginemen are usually released from responsibility from all but exterior inspection of engines together with certain other features on which they are required to report, but constant checks must be made to determine how carefully the enginemen make out the items on the report for which they are responsible. It is often found that a number of parts marked on the top of a work report as being in good condition will be reported in need of repair under special notations at the bottom of the form. Experience in certain cases has shown the possibility of marked improvement in engine inspection methods by giving the inspectors special instruction and examination at stated intervals.

Following are some of the factors which must be kept in mind in developing the most desirable kind of work report: (1) Work must be definitely specified to avoid loss of time of mechanics in locating and correcting it; (2) space must be available for a detailed report of all work necessary, together with repairman's signature in order that responsibility for the repairs may be definitely located; (3) since routine work incidental to checking a large form has a tendency to promote slipshod inspection, too much detail must not be shown on the printed form; (4) this will also save the inspector's time which may be more profitably concentrated on specific parts which are giving trouble.

Take care of machine tools

Fundamentally, railroad repairs are on a job shop basis requiring a variety of machine tools, all of which handle many different jobs, each requiring a different set up. This factor, together with the time element which enters into the majority of the railway repair jobs, results in the machine tool equipment having to withstand much harder usage than is common to machines on production work. As a result, it is not uncommon to find a foreman embarrassed owing to a machine torn down for heavy repairs. Of course, machinery will wear and must be repaired. But, in many cases, the extent of the repairs required could be reduced considerably by the application of a few simple precautionary methods.

First of all, a machine repairman or repair gang should be selected for their all round mechanical ability and resourcefulness. These men should be trained to watch all machines closely and, at the first sign of impending trouble, should take the machine out of service and make any necessary repairs before a serious breakdown occurs. When a new part has to be machined in a hurry, accuracy and the ability to follow instructions should be the paramount qualifications required of the man selected to do the work. A poorly or inaccurately machined part will, in many cases, necessitate tearing down the machine again after it has been repaired. In order to secure good workmanship this man should receive satisfactory compensation for his ability, especially if he is taken off a piecework job to do such work.

Another factor affecting the extent of serious machine breakdowns is the operator, particularly if he is working piecework. A skilled operator, accustomed to his machine, should know at once when it is not performing properly. When he is suspicions of impending trouble, it should be promptly reported to the foreman. If he does not do this, he is not only hurting himself financially, but is not playing fair with his foreman, who is responsible for production. If, however, the foreman disregards a timely warning on the plea that the machine cannot be taken out of service at that time and then the machine completely breaks down, the foreman is not only a deterrent to employee co-operation, but is also a shortsighted supervisor.

There are a few mechanical features on machines which can be readily improved at a minimum expense and time which will aid materially in prolonging the service life of a machine. Many machines, purchased ten years or more ago, lack provision for proper lubrication, having a number of small uncovered oil holes. Many of these machines are not provided with wicks in the oil holes or provision to filter out any grit fed in with the oil. Still fewer are fitted with felt for distributing the oil and wiping cuttings off the journals to prevent galling. These defects are usually simple and can be easily remedied by a small amount of time and effort.

Ten years or more ago heat treatment was not as highly developed as now. As a result, in machines ten years old, many of the parts subjected to wear cannot withstand the wear imposed on them in the railroad shop. It has been found worth the time to take out such parts and caseharden or heat treat them properly, thus greatly prolonging their wearing life and accuracy. It is also another good policy whenever machines are overhauled to chamfer off the corners of gear teeth to a radius equal to one half the tooth depth and to file all burrs or sharp edges on the teeth or other wearing parts.

The policy of keeping all machine tools at a high state of efficiency reverts back to the old adage that "an ounce of prevention is worth a pound of cure."

Factors contributing to good shop operation

Elsewhere in this issue appears the second and concluding article describing the Pennsylvania Railroad's new locomotive repair shop, a unit of the Altoona Works, in which, during the 22 working days in the month of December, 1925, 103 locomotives received classified repairs. This output is a real achievement when it is taken into consideration that the work was done on 45 repair tracks which means that over two locomotives were repaired on each track during the month. These results were made possible by those responsible for the shop layout, equipment and organization. The shop is not entirely self-sustaining owing to the fact that it is furnished with new repair parts in a semi-finished state by other departments of the Altoona Works. As a result, the machine tool bays in the erecting shop were planned only to restore worn parts to standard dimensions and to complete the work necessary on new semi-finished parts. As a result, the number of machine tools for each locomotive repair track is considerably below the average figure.

Another factor that helps make possible maximum production is that, as a general rule, only four types of locomotives are repaired in this shop; namely, the Mikado, Decapod, Santa Fe and heavy Pacific types. As a result, the shop is equipped to handle these locomotives to the best advantage. Furthermore, the personnel of the shop becomes so familiar with these locomotives that in time they become specialists on these limited number of types, which is a big factor in maximum production. Of course, this method is only possible where a railroad has a large number of locomotives of the same type Standard locomotive equipment on any railroad is conducive to economical repairs.

Another contributing factor to the shop output is that all new and repaired parts are finished to standard dimensions. This is made possible by the extensive use of micrometers and gages. The railroads have been somewhat reluctant to work to close tolerances, the contention being that it is not necessary for locomotive repairs. At the Altoona Works, however, all fits wherever possible are either ground, milled or turned to tolerances measured in thousands of an inch so that all parts go together when assembled without the hand filing which is so prevalent in the average shop.

Since this is one of the largest shops, if not the largest shop in America devoted exclusively to locomotive repairs, it might be considered as offering a splended opportunity for the employment of an elaborate scheduling system. The volume of work passing through this shop might justify the overhead which, in the case of some smaller shops, has tended to defeat the purpose of elaborate scheduling systems. The system employed in the new plant, however, is one of the simplest in use in any railroad shop in America. That it is effective is suggested by the fact that, during December, every repaired part was finished and delivered according to the scheduled time.

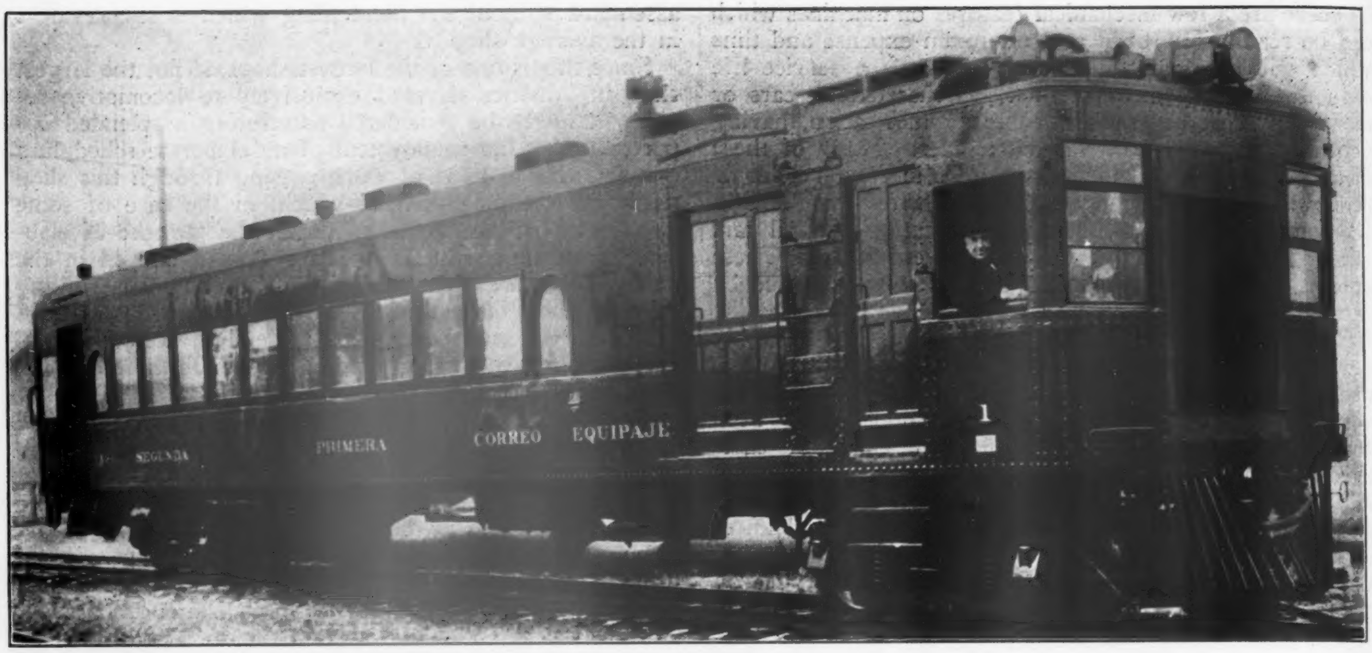
Another factor contributing to the shop output is the selection and arrangement of the machine tools and shop equipment. The tools were selected with the following points in mind: to maintain heavy locomotives, to machine to the close limits made necessary by micrometer measurements, and to mill and grind wherever possible to do so.

No doubt a greater degree of specialization and refinement of certain practices is attainable in a shop of such large size than would be practicable in the average locomotive repair shop. But a close study of the methods and practices which characterize the new Pennsylvania shop indicates that by no means do all of them depend for their success on the magnitude of the operations with which they are associated. Standard tolerances, accompanied by precision methods of measurement, for instance, have a wide range of applicability and when such tolerances are once established it will be found that satisfactory fits are less difficult to attain than they are when the entire question of tolerance is left to the judgment and skill of the individual workman.

New Books

Traveling Engineers' Association. *Edited by W. O. Thompson, Secretary,* 1177 *E. 98th St., Cleveland, O.* 355 *pages,* 6 *in. by* 8½ *in. Bound in Cloth.*

The proceedings of the thirty-third annual convention of the Traveling Engineers' Association held at Chicago, September 15, 16, 17 and 18, 1925, is of interest to road foremen of engines and others concerned with the problems of better locomotive maintenance and operation. In the front of the book is a list of the 1925-1926 officers and the constitution of the Traveling Engineers' Association and a brief report of the subjects considered at each convention since the first, which was held at Chicago in 1893. The report of the convention is divided into seven parts, one for each session. The six papers read and discussed during the convention dealt with the following subjects: Progress made on mechanical stokers and its effect on the cost of maintenance and operation; what progress has been made in the drafting of locomotives with a view of increased efficiency and economy in coal and oil fuels; mechanical appliances for lubrication of the modern locomotives; loss damage and discomfort due to rough handling by improper use of locomotive and air brake; the traveling engineer as a factor in dissemination of information to employees for economical movement of transportation; automatic train control. The majority of these papers were printed in abstract in the October, 1925, issue of the *Railway Mechanical Engineer.* A comprehensive index in the back of the book enables any of the papers as well as the discussions by the various members, to be located readily.



Gas-electric car for the Mexican National Railways

Diesel locomotive possibilities*

Main problem development of satisfactory machine at satisfactory price to user—Electric transmission favored

By Samuel M. Vauclain,
President, Baldwin Locomotive Works, Philadelphia, Pa.

THE steam locomotive has dominated transportation since its successful introduction approximately 100 years ago. It has steadily improved. Its performance, through greatly increased tractive force, has met the needs of modern transportation arising from the tremendous development of the world in the past 50 years. As a single self-contained power unit it is without equal so far as its general efficiency and low cost of production are concerned. Therefore, when discussing railway motive power, the standard of comparison must be the steam locomotive, which occupies a strongly entrenched position from both practical and sentimental viewpoints.

With the established efficiency of modern internal combustion engines before him, the designer of railway motive power is naturally attracted toward their possibilities of employment within his special field of endeavor. The Diesel motor shows an overall thermal efficiency as high as 33 per cent, while the best steam locomotive performance is about one-quarter of this figure. But even with this handicap, the steam locomotive of today is a remarkably flexible and reliable traveling power plant. In order to compete properly, no matter what the fuel economies may be, the internal combustion locomotive must approximate this same flexibility and reliability. It must have ease of control, ability to start a full tonnage train, and adaptability to the rapid change in physical conditions met in operation, such as variable speeds, gradients, curves and weather conditions. It must not be too complicated in detail nor too heavy per horsepower developed. Herein, then, are the basic features which the designer must constantly bear in mind. While a gain in thermal efficiency will warrant an increase in initial cost, the price must not be so prohibitive as to offset the anticipated gain in cost of operation.

European experience in Diesel locomotive construction has been more extensive than that of the United States and some late opinions on comparative costs are interesting. J. W. Hobson, of R. & W. Hawthorne, Leslie and Company, in an engineering discussion of 1925, states that in England the cost of Diesel locomotives with hydraulic transmission averages about 1.48 times the cost of a steam locomotive of equal capacity, complete with tender; and that the same measure of comparison for a Diesel-electric locomotive yields a ratio of 1.9. Dr. Herbert Brown, of the Swiss Locomotive and Machine Works, Winterthur, Switzerland, states that continental figures on the same basis yield an average cost for the Diesel-electric locomotive equal to 1.783 times the cost of the steam unit.

The problem naturally divides itself into the development of two general classes of power: self-propelled vehicles for light traffic, and locomotive units for hauling trains equal in tonnage to those hauled by steam locomotives. The first division offers easier accomplishment because the power required is low and the weight of engine and transmission details, compared with the entire weight of the vehicle, will make possible an economical unit; one which can be kept well within the restrictions of axle loadings, while allowing a high weight per horsepower developed. As the average full powered steam locomotive can be built within a weight of 140 lb. per horsepower, it should be quite easy to produce a low powered

*Abstract of a paper presented at Midwest Power Conference, Chicago, Jan. 29, 1926.

vehicle weighing, say 90,000 lb. (the weight of a modern steel day-coach) and operate it by power units producing 200 hp.; an arrangement giving 1 hp. to every 450 lb. Such a vehicle, even if the weight is increased by its machinery to 100,000 lb., can be operated economically up to its capacity, serve the needs of a light, or branch line traffic, and still not exceed an axle loading of 30,000 lb. on its principal driving axle.

Weight per horsepower a vital factor

In applying the Diesel heavy-oil engine to true locomotive units, the first consideration must be of the weight per horsepower developed. The heavier classes of Diesel engines in stationary service weigh within a range of 170 lb. to 350 lb. per horsepower. In locomotive service the weight of the Diesel engine must be added to the weight of transmission, running gear and vehicle body. If a 1,000-hp. Diesel engine of 170 lb. per horsepower is used in a locomotive, its weight of 170,000 lb. would exceed the total weight of a complete steam locomotive of like capacity. During the great war some Diesel engines for submarine service were built showing a horsepower for every 65 lb. of engine weight. The locomotive designer needs this type of machine. The 1,000-hp. Diesel-electric locomotive built in Germany for the Russian Railways (1924) has a total weight of 275,000 lb.; 275 lb. per horsepower.

Gas-electric locomotive built for plant switching service by the General Electric Company

The 1,000-hp. rated Diesel-electric locomotive built in 1925 by the Baldwin Locomotive Works also weighs 275 lb. per hp. This indicates a close coincidence of the best European and American practice and sets for the present this weight per hp. for modern Diesel-electric locomotives. A slight decrease in weight can be looked for with an advance in locomotive horsepower, and the present expectation in this respect is about 220 lb., which represents a ratio of about 1 to 1.5 when compared with an average steam locomotive. With a thermal efficiency of 3 to 1 in favor of the Diesel engine, it appears that the added weight per hp. is not a severe handicap. Ratios of this character, provided they go hand in hand with simplicity, should show attractive operating economies. What, then, should be the features tending toward simplicity of maintenance?

Inasmuch as the Diesel or other internal combustion engine must be operated at speeds within its range of efficiency, and not a practically zero start, as in direct connection, the designer must find proper means for connecting the running prime mover to the locomotive driving mechanism. This transfer of power can be accomplished in three ways: By mechanical, stepped-gearing transmissions; by hydraulic, fluid-pressure transmissions; and transmission of power by electricity. Each of these systems will be separately described and examples given of locomotives so equipped.

Mechanical transmissions—These are of the ordinary change-speed stepped-gearing variety as applied in automobile practice, although in locomotive construction they should preferably be arranged to give the same range of speeds both forward and backward. Reversing is usually accomplished by bevel gearing. Mechanical transmission requires some sort of a friction clutch and this feature gives trouble on the upper range of power to which mechanical transmission is applicable. It is probable that 150 hp. is the practical limit for mechanical transmission.

Hydraulic transmission—This form of transmission usually employs oil as a power transference medium, and is attractive because of the possibility of infinite speed variations; some designs, however, fail to secure this possibility. Hydraulic transmission is suitable for locomotives of comparatively high power and shows less initial cost than electric transmissions of equal capacity. It has, however, the disadvantage of concentrating its final driving power into one gear wheel, which makes it dependent on tooth contact and pressure. Its limitation is probably in the neighborhood of 500 hp., although its advocates claim adaptability to twice this figure. All designs employ a primary unit, or pump, which supplies oil under pressure to a secondary unit, or rotor. If the stroke of the pistons in the primary unit permits variation from zero to maximum, it follows that variability of speed can be obtained in the secondary unit, which is practically of reverse operation to the primary one. The Hele-Shaw and Lentz transmissions are the best known examples of the hydraulic transmission.

The Lentz system, which is usually considered the most successful hydraulic transmission, does not give infinitely variable speeds, but because of its simpler construction and the lower oil pressures employed, avoids the operating mishaps of more complicated systems. It gives a definite number of primary speeds, and intermediate speeds are obtained by the by-passing of the transmission oil, or by varying the speed of the main motor. As the oil pressures in the Lentz gear do not exceed 500 lb. per sq. in. at starting and average 50 to 150 lb. when operating at speed, leakage is not so serious a matter as with the other types of hydraulic transmissions. Numerous European locomotives have been fitted with the Lentz gear, including four 400-hp. engines manufactured by the Linke-Hofmann Company for the German State Railways. A 60-hp. Lentz engine tested in 1924 on the London and North-Eastern is reported to have given highly satisfactory results within its power limitations.

The Schneider system is really a combination of mechanical and hydraulic transmission, the increased torque required at low speeds being obtained from the relative motion between the rotor and its casing. The energy due to slippage augments the power by an additional torque on the secondary unit. By this arrangement the usual power losses in hydraulic transfer are decreased and the general efficiency of the transmission is improved, especially at the higher operating speeds.

Electric transmission—In this system the prime mover is connected to an electric generator which furnishes current to operate suitably disposed driving motors. Electric transmission gives a continually variable gear, allowing the locomotive to adapt itself advantageously to the speed of the prime mover. It makes driving easy and is readily adaptable to double-end control. The installation is expensive, but from the railway operating viewpoint, is the most attractive transmission. Within recent years quite a few Diesel-electric locomotives have been built in Europe and the United States.

The Diesel-electric locomotive that has attracted most

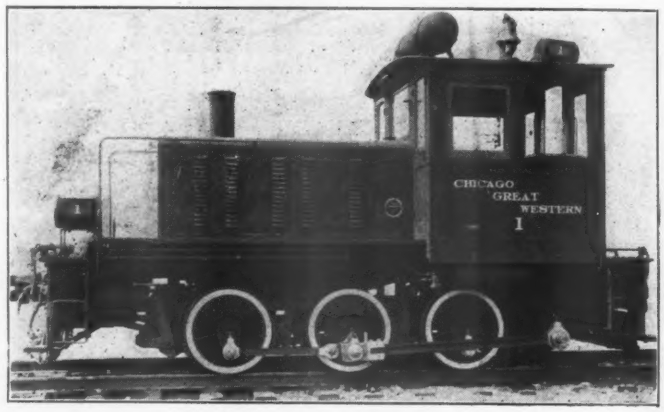
attention in Europe is the design by Professor Lomonossoff, constructed at Dusseldorf, Germany, for the Russian Government Railways. This machine is a unit in the elaborate program of comparison planned by the Soviet authorities. It is of 2-10-2 wheel arrangement, with five motor-driven axles. It is arranged for double-end control, the drivers' cabins being located over the carrying trucks. The engine is a Diesel submarine type, four-cycle, six-cylinder unit, with compressed air fuel injector. Its normal speed is 450 r.p.m.; its maximum power, 1,200 hp. The locomotive unit itself is rated at 1,000 hp., and to verify this rating the machine was thoroughly tested on a special plant, similar to that of the Pennsylvania at Altoona. The generator is of 800 kw. capacity at 600 to 1,100 volts and is directly coupled to the prime mover by a flexible coupling. The exciter, carried on the end of the generator shaft, is itself excited by an auxiliary dynamo operated by a storage battery. A peculiarity of the locomotive is its cooling system, located at one extremity of the structure. The water flows through a piping system cooled by a fan-forced circulation of air; this is quite ordinary and is reported to be sufficient for the cooling requirements during winter and ordinary temperatures. Summer operation in such temperatures as are common in Russian Turkestan, 120 deg. F., will so overload the engine cooling system that a cooling tender must be used which carries extra radiating equipment with fans driven by an auxiliary Diesel engine.

The engine weighs 340 lb. per horsepower. This feature is certainly not in line with the all around utility ideas common with railway men in the United States. The Lomonossoff locomotive was assembled at the Hohenzollern Locomotive Works in Dusseldorf, where tests were made on the roller plant. A comparison was made of these with tests of a Russian type 0-10-0 steam locomotive, oil fired. Dr. Herbert Brown of Winterthur, who personally assisted in these tests, reports an average overall thermal efficiency of 7.43 per cent for the steam locomotive and 26.4 per cent for the Diesel-electric, showing the latter to have been over 3½ times as efficient as the steam locomotive; very significant figures when first cost and maintenance charges are to be considered. Dr. Brown also gives information on the weight of component details entering into the Diesel locomotive ensemble. He estimates that the prime mover, including its auxiliaries, takes about 44 per cent, the total weight of the electrical equipment 30.5 per cent, leaving for the mechanical structure and running gear only 25.5 per cent.

Much further development work on Diesel locomotives is essential

It is my opinion that considerable time must elapse and many millions of dollars be expended in the development of an oil-electric power unit in the shape of a locomotive before machines of this type will figure to any great extent in transportation service. It has many apparent advantages that are not only of great interest to railway men, but which are very seductive to those who do not clearly understand all that is involved. You will have noted that at the present time construction costs are as 2 to 1 compared to steam power. We have all the same thought: if a Diesel engine-driven locomotive as serviceable as the present steam locomotive and as economically maintained in service can be produced, great relief and resultant economy will be obtained by the elimination of ash pits and the various ash-handling devices connected therewith, by the avoidance of the necessity for transferring refuse and the periodical attention required to keep the ordinary steam locomotive in proper condition for service, not to mention the satisfaction that the elimination of boiler explosions, etc., will bring to those men responsible for railroad motive power. It must not be forgotten that these anxieties have been almost entirely removed by proper regulation of the maintenance and use of steam locomotives and the only accidents now being recorded are those due to the personal equation, and which, therefore, can never be entirely overcome.

The internal combustion locomotive unit, whether constructed with direct drive, hydraulic transmission, or electric transmission, is yet in its infancy. The best engineering talent of the world is bending its energy to a successful solution of the problem and we will not know what new difficulties in operation will be encountered or what the anxieties of the future may be in the matter of safety until the actual operation of some appreciable number of engines gives us a thorough experience. The introduction of electric power for transportation purposes has been slow. The expense of installation and the general inconvenience and obstruction incident to its application in service yards and large railway terminals have militated against it; but step by step it has progressed and become a necessity for all underground transportation, or for increasing the volume of traffic handled over such sections of railway as are difficult of operation and on which the use of steam locomotives has reached its limit.



Baldwin internal combustion locomotive built for the Chicago Great Western

If it will be possible for those of us engaged in the development of internal combustion locomotives to produce a satisfactory machine at a satisfactory price to the purchaser, its greatest effect upon the transportation methods of the country will be to further the electrification of railways in general. This experiment is now being tried in Switzerland, as I have previously stated, and if by the use of internal combustion locomotives all branch line service as well as all distributing service at railway terminals, both large and small, can be satisfactorily accomplished, and only main line service by overhead wires or third rails be required, we can then expect a more rapid development in the electrification of our railways. But it will be many years before the steam locomotive, owing to its simplicity, its serviceability and its low production cost, will be relegated to the era of the past.

A CAR BUILT for the United States Army Air Service is designed for transporting helium gas from Fort Worth, Tex., to Langley Field, Va., Aberdeen, Md., and other points where airships may need to have their supply replenished. Three forged steel tanks or bottles are built to stand a pressure of 2,000 lb. per sq. in. and will carry 207,000 cu. ft. of free helium. The car weighs, empty, 197,200 lb. The maker, the Bethlehem Steel Company, is building another of the same kind at its Johnstown (Pa.) shops. The cars, each 42 ft. long, have Westinghouse friction draft gears, type N-11-A.

Some of the Missouri, Kansas & Texas apprentices who attended the second birthday banquet at Parsons, Kans., of the apprentice schools.

Railway apprentice training

Skilled, thoroughly-trained mechanics must be provided—Number of apprentices—M-K-T requirements

By T. C. Gray

Supervisor of apprentices, Missouri-Kansas-Texas, Parsons, Kans.

As an apprentice, I was told a great many times by machinists that I should never tell or show a helper anything that might enable him to learn the machinist's trade. I remember, in one particular instance, while working as an apprentice in a roundhouse, I received a good "bawling out" from a machinist for figuring valve changes on the side of a locomotive cylinder. He informed me, in no uncertain terms, that the first thing I knew all the helpers in that vicinity would be "settin' valves." I thought they must be a bright lot of men. I had labored and studied in the valve gang and figuring valve changes came hard for me. And, I had been taught how to figure them! If these helpers could catch on that easily and quickly, surely, they must have something that I lacked.

I learned after completing my apprenticeship that I must not, under any circumstances, let my helper do anything that might teach him the trade. I must not let him even "start on" any nuts or perform any of the mysterious rites of my trade or he might learn to handle my job. And there were other "must nots" too numerous to mention, which the grievance man made it his business to see were not violated. This grievance man was surely loyal to our trade. He spent the greater part of his time seeing that we lived up to the various rules pertaining to it. I learned later that he had been promoted from the rank of helper during the World War.

I never was in sympathy with such rulings, and took a great delight in trying to show and teach my helper everything within my power. I found that the helper was just as much of a human being as anyone, and should therefore be entitled to the rights and privileges of this great country. I found that he was just as interested in accomplishing and doing and learning as the average man. If I could interest him in the work we had at hand, he accomplished much more than if I tried to hide the "mysteries" of my trade and treated him as if I did not care what became of him.

The railroad mechanic

I have always had the highest respect for my trade. I have respected it too much to believe it possible for anyone to learn it in any other way than by a thorough training of an all-around nature. I am thinking of the railroad mechanic—I know very little about the "contract shop mechanic." I do know, however, that the particular branch of the navy in which I served as a mechanic during the late war sent recruiting officers out to nearby railroad shops to recruit railroad mechanics. And this particular branch required the best of mechanical knowledge and ability, and had nothing to do with the sort of work with which the railroad mechanic was accustomed. This was in the submarine branch of the navy and the work required the operation and maintenance of large Diesel engines. Mechanics trained in the railroad shops proved as valuable, if not more so, than the much-talked-about "contract shop men." The railroad mechanic had been trained in such a way that he understood what was wanted. He knew how to "tackle" any job. He had learned to think and to study the work at hand.

We have some railroad men that do not believe it is necessary and essential that we train mechanics. This is evidenced from the fact that a large number of our roads are not supporting a systematic method of apprentice training. I have wondered if they are not influenced by the outcome of the late labor trouble. Were our railroads able to "carry on" with a new personnel made up of men who had never been in a railroad shop before the trouble? I have heard this opinion voiced a great many times. Is this true? Is this a fair way of looking at the situation? I do not believe it is true. It is true that we had a large influx of green men into our shops at that time. But, it is also true that a large number of mechanics "hired out" on other roads. We have to admit that the difference in trying to "carry on" without enough trained men was surely noticeable. How we prayed for a few "real mechanics." The requirements of the rail-

road mechanic have surely been underestimated since the labor trouble.

Misunderstanding about necessity of apprenticeship

I believe the radical change in attitude on the part of the personnel, since the labor trouble, has had some influence on the question of apprentice training. The situation, before this trouble, had reached the point where shop management was practically out of the hands of the shop supervisors. The petty laws of the union men were many and made the job of the supervisor doubly hard. A great many small jobs that could have been handled more efficiently by one craftsman, required three or even four. We are not troubled with these petty laws and rulings anymore, and I have wondered if the majority of disbelievers in apprentice training are not influenced by this radical change in relationship. I wonder if they haven't overlooked two very important factors in industrial management, personnel and instruction. And I believe the former is a function of the latter.

Every progressive organization is trying to perfect its personnel. There surely can be no better way to do this than by getting good material and getting it young and training it and instructing it along the lines that the particular organization should have it trained. The mechanical department needs trained men and this demands some sort of training system. The present-day apprentice system offers a solution of this most important and vital problem.

Very few railway officials realize the importance of apprentice training or pay any particular attention to the curriculum of the schools on their road. Experience is the greatest teacher in the world and they are in a position to know just what their future mechanics, supervisors, and officials should be learning. The regular apprentice serves 832 hours in the schoolroom. A great many things can be learned in this time. Also, a great many hours may be wasted. The apprentice school work should parallel the shop work. More time should be spent in the schoolroom on "hammer, chisel and monkey-wrench" instruction than on the three "Rs." Success in trades-training work may be measured by the amount of interest shown by the apprentice personnel. It is not possible to interest a boy in something in which he can not see any practical value. Too much time is spent on mechanical drawing in the majority of apprentice schools. We do not want our mechanics to be expert draftsmen. They can learn the art of blue-print reading and sketching without spending more than half their time in the schoolroom over a drawing board. The school curriculum is very important and the apprentice instructor who guides the destinies of one hundred apprentices in the schoolroom is entrusted with a grave responsibility.

The apprentice system on the Missouri-Kansas-Texas Lines was organized in May, 1924. We have gone along slowly and deliberately and have met with fair success. We believe that we have some mighty good material in our apprentice personnel. The preliminary home and school training that our boys receive before entering our apprentice ranks is most important. We are very anxious to get the very best material. With this in mind, we are co-operating in every way possible with the boards of education in the cities where we maintain shops. *We hope to have a railroad course in each high school next year.* This will be a lecture course and our representative men will address the senior high school boys once every two weeks during the school year, telling them about the transportation game and what it has to offer young men. We hope to interest some good material which otherwise might not have known of the interests in the railroad game. And we may discourage some boys who had been planning on a railroad career.

What should limit number of apprentices

The number of apprentices in each trade is usually thought of as a function of the number of craftsmen. Is this true? I do not think it should be treated in this light manner. Apprentice training is primarily for the purpose of supplying mechanics and supervisors as needed. This demand is a function of economic conditions. The number of craftsmen needed is also a function of economic conditions, but the training factor should not be forgotten. What is the best way to train mechanics? The apprentice system should be an economic asset. The railroad should be getting third-year value from a third-year apprentice. In order to get this value it is necessary that the railroad establish a systematic shop and school routine for the apprentices. The machinist apprentice should not be started in the valve gang; neither should he complete his apprenticeship on a drill press. In order that apprentices advance along this systematic routine, the hiring of apprentices has to take place at equal and regular intervals. The number of apprentices in each trade is a function of a particular shop's training facilities. A shop can train a certain number of apprentices and train them right. It has a certain number of available apprentice jobs. Economic conditions should not govern the number of apprentices if we have an ideal system. The only thing that should change the number of apprentices is the changing of the shop's physical condition.

Shop instruction is very important. Each shop foreman should be interested and feel his responsibility in the apprentices under his supervision. He should be held responsible for the boy learning the essentials of each step in the shop routine. The essentials should be outlined in order that the foreman will understand what the boy must know when he leaves his particular gang. We claim that we have a shop instructor for every three or four boys. Each boy is given an examination on the shop work just completed when he advances one step in our routine. The shop superintendent knows what grade the boy makes on this test, and if it is a low one finds out whether the foreman or the apprentice is responsible. The apprentice is given a notebook in which he enters all his examinations, problems, sketches, federal rules, standard practices, etc. He is allowed to use this notebook when taking his final examination, but can use no other reference.

Apprentice training should be taken more seriously. We do need trained men on our railroads. If we expect to keep up with the trend of times, for which our great transportation systems are directly responsible, we must not forget the importance of the proper sort of instruction.

We have a printed booklet which we ask each prospective apprentice to study carefully. It is too long to reproduce here but the following extracts from it may be of interest:

Are you looking for work? What is work? You are probably leaving school and are planning on "going to work." Do you realize the importance of this step? Why are you going to work? Why do you choose the railroad game?

Work is the art of producing movement against some resisting or opposing force. Does this definition mean anything to you? Under the above definition, wouldn't play be work? It certainly is work, but it is pleasant and agreeable work and we do not associate work with play. All play is work and yet all work is not play. You are about to make one of the most important decisions in your life. You are choosing your life's work. If you choose your life's work in such a way that it will be interesting and really be play, your chances of some day holding a responsible position are many. If you should be unwise and foolish enough to

choose your work in such a way that the clock interests you more than your work, that the hours seem long and there are fellows in other lines of endeavor that you envy, you will never rise above the ordinary worker. It is very essential that you be interested in your work. You will be given many jobs that will be hard and heavy and dirty. These will serve as a test. If you are the man you will have to be to some day hold a responsible position, you will go through such tests with "flying colors" and the firm determination that you dare anyone to stop you on your road to success. *Where you will be ten years from now depends entirely on how you apply yourself during the next ten years.*

* * *

We are very proud of our railroad. We realize that it runs through a prosperous and rapidly developing section of the country. We are proud of our modern locomotives and fine cars, and other up-to-the-minute equipment. We are proud of our organization and deem it a great privilege to be a member of the Missouri-Kansas-Texas family. If you should be so fortunate as to be taken into our apprentice organization we shall expect you to uphold our traditions and help us in training you to be a "Katy-man."

Be loyal to your railroad. If you are *loyal* you will not be satisfied to do *fairly well* what ought to be done *very well.*

Among the rules are the following:

Apprentices assigned to special duty, such as test work, will not be required to attend school. No apprentices will be assigned to special duty who are not ahead of the school room schedule and have a good shop record. Upon the completion of any special work the apprentice must write a letter to the supervisor of apprentices, in which he will give a complete description of the kind of work performed and tell how he was benefited by the special work.

All apprentices must attend the monthly apprentice club meeting and endeavor to take an active part in the management of the club.

Probationary period.—During the first six months you will be on trial. This is a probationary period and we will determine in this period whether or not we think it advisable to keep you in our organization. At the end of this period you will be called before the Apprentice Board for its decision as to whether or not you remain an apprentice. At the end of the probationary period the apprentice instructor shall send a letter to his shop superintendent, copy to supervisor of apprentices, saying:

John Doe, machinist apprentice this point, has completed his probationary period and has an average grade in the following items:

School	Effort
Shop	Interest
Mechanical ability	Self reliance
Common sense	Morals
Attitude	Physical
Leadership	Average

In lieu of the above I do (or do not) think it advisable to keep this boy in service.

(Signed) Apprentice instructor.

School routine.—The apprentice will follow our regular school room schedule as closely as possible. The work is so arranged that he will have to work to keep up with our standard requirements. All work has a time limit and the average boy can keep up by putting forth an honest effort.

Shop routine.—The apprentice will be given a routing card when he starts to work. This card will become the property of the foreman under whose supervision the boy is placed. The foreman will fill out the card properly each month and when the boy is ready for a change he is to give the card to the boy with instructions as to where he is to take the card. Proper instructions for handling are on the card. The card will be given the boy at the apprentice school when he returns the indenture properly signed. A similar card will be kept at the apprentice school and in the office of the Supervisor of Apprentices. The Apprentice Instructor shall be responsible for all changes and shall make changes to correspond to our routing schedule as closely as economic conditions will allow, and he will send a list of recommended changes each month to the Shop Superintendent. The Shop Superintendent shall make the changes as recommended.

Monthly shop supervisor's report.—This will be filled out each month by the shop supervisors. It shall be sent to the apprentice school not later than the 10th of the month.

Shop instructions.—Each foreman will be responsible for the apprentices under his supervision and shall be held responsible for the apprentices learning the essentials of each job. In this way we have a shop instructor for every three or four apprentices.

Number of apprentices.—The number of apprentices in each trade will be governed by our training facilities.

Home work.—The apprentice is encouraged to do outside study and reading and subscribe for at least one good mechanical publication. Should he fall behind the school room schedule he must make this up on his own time. No apprentices will be graduated who have not completed the entire schedule, including the final examination.

Helper apprentices.—Men who have had at least two years' experience, or the equivalent of two years as a helper in the work of their chosen trade, may be employed as helper apprentices if approved by the Supervisor of Apprentices.

Special apprentices.—Special machinist apprentices must be graduates in railway mechanical engineering of technical universities. They will not attend the apprentice school, but will follow our shop routine as outlined for them.

Apprentice board.—The Apprentice Board is composed of the shop superintendent, general foreman, machine foreman, erecting foreman, boiler foreman and apprentice instructor. This board is presided over by the shop superintendent and meets once each month. All members of the board are active in their efforts to bring out all matters pertaining to the apprentices. They are particularly interested in those who are in arrears, or upon whom an unfavorable report is made by some member of the board. Delinquent boys are brought before the board, told of their weakness and what is expected of them if they remain in the service. Due consideration is given each boy, but boys found to be incompetent are dropped from the roll of apprentices and not allowed to drag along from month to month. The board not only discusses the qualifications and fitness of each of the apprentices, but takes up any other subjects it feels are of interest and value in the training of apprentices.

Efficiency rewards.—Apprentices who average 95, both in shop and school work, for 12 consecutive months are given 100 hours on their apprenticeship. If an apprentice has an average grade of 90, upon the completion of his apprenticeship, if selected by the Apprentice Board, he may serve an additional year as a special apprentice. This year is similar to the last year served by a special apprentice. Upon recommendation of the Apprentice Board, the apprentice may be given 100 hours for extraordinary work; or have 100 hours deducted from his service for spoiling work or breaking any rule.

Length of apprenticeship.—Regular apprentices shall serve eight periods of 1,160 hours each. Special and helper apprentices and freight car apprentices shall serve six periods of 1,160 hours each.

Apprentice club.—Apprentice clubs are organized at each point where we have schools. All apprentices should take an active interest in their club.

Athletics.—Amateur athletics are encouraged among the apprentices and the physical side of the boy's life is not forgotten.

Get the men interested*

By Harry Gardner

Roundhouse foreman, Chicago & Eastern Illinois, Salem, Ill.

THE way I handle men is to give them just as much freedom as I can as long as it doesn't interfere with the instructions of the company. First, I study the men to try to find what they work best at by changing them from one job to another. And when you get a man interested, try to get him to study his line, and just a little patting on the back and you can save the driving for the man on the job he is not fitted for.

I have known men to work in a blacksmith shop all their lives and never learn to swing a sledge in a proper way. I had several helpers a short time ago that were not good sledgers and the mechanics complained. I showed them what I could about sledging and there was still lack of harmony between the helpers and mechanics. One day during lunch period I bet a man that there was

* From a contribution to the *Railway Mechanical Engineer* competition on the opportunities and responsibilities of the foreman.

not a man on the job that could take a smooth block of wood and hit an overhand blow with a fourteen-pound sledge, and leave a square impression in the wood where the sledge hit. They all tried and failed. But a new spirit arose, and they took a different interest; it was nothing uncommon to find a block of wood all hammered where someone had practiced using a sledge, and they are all good helpers now.

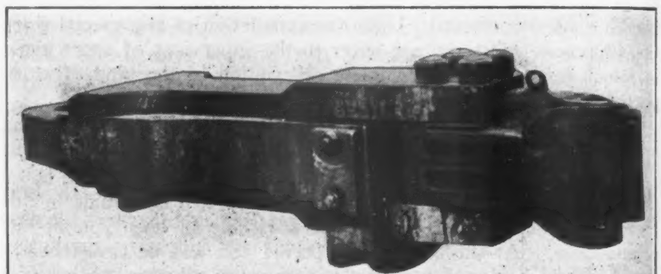
I study out plans of this kind to get the machine-men boilermakers, tank-men, fire-builders, toolroom-men and laborers interested in their work. What I am trying to show is that it is better to reason it out with a man than it is to try to drive him. I always try to put myself in the other fellow's shoes before I criticise him. Honesty is my policy. I have had the officials over me say that I was getting to be a regular lawyer, arguing in behalf of my men. The men the argument arose over would state I was overworking them, trying to put a feather in my own cap and this all in the same day. But a policy of square dealing will get results.

Mechanical design of Virginian electric locomotive

THE undertaking started by the Virginian Railway in 1923 to electrify 134 miles of its main line extending from Mullens, W. Va., to Roanoke, Va., brought with it a problem in heavy traction never before attempted. The road profile shows that between the coal-receiving yards at Elmore, W. Va., and Norfolk, Va., the heavy grades, reaching a maximum of two per cent, are confined to the section between Elmore and Roanoke, and it is on this section also that the curves are severe, reaching a maximum of 12 deg. The capacity of the section between Elmore and Roanoke is in reality the capacity of the entire system and for this reason the railroad has always faced the problem of designing heavy motive power, leading all other roads for size and hauling capacity of locomotives, the electric locomotive being no exception. The hauling capacity rating of the electric locomotive shown in the illustration and built by the American Locomotive Company, New York, and the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., at 30 per cent maximum adhesion requires 900,000 lb. of adhesive weight for the necessary 270,000 lb. tractive force.

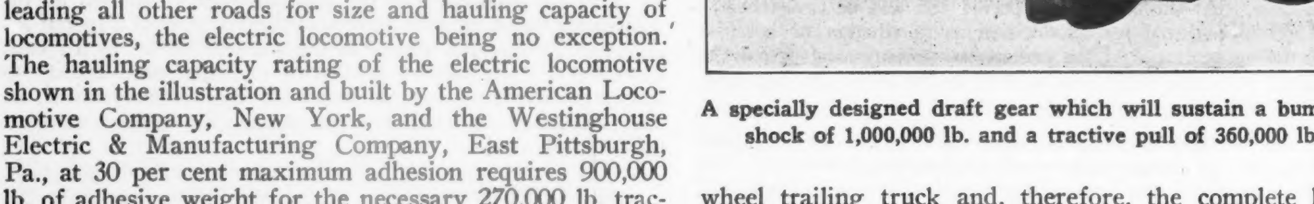
Wheel arrangement

The problem of distributing 900,000 lb. of adhesive weight, and at the same time of providing a flexible wheel arrangement that would successfully negotiate the road curves both in hauling at the front and pushing at the rear of the train, brought out the fact that the 12 pairs of driving wheels must be divided into three section, each section provided with a two-wheel leading and a two-wheel trailing truck and, therefore, the complete locomotive is known as the 282-282-282-E class, the letter E standing for electric.



A specially designed draft gear which will sustain a bumping shock of 1,000,000 lb. and a tractive pull of 360,000 lb.

The spring-supported loads on each separate wheel base are carried on a three-point equalizing system; one pair of drivers being cross-equalized with one truck forming the single point, and three pairs of drivers equalized with the opposite truck forming the other two points.



The spring-supported loads are carried on a three-point equalizing system

This arrangement of the equalizing system shown in one of the illustrations is considered as giving a greater reaction against the rolling of the spring-supported loads than a symmetrical arrangement with two pairs of drivers in the cross-equalized and two pairs in the non-cross-equalized system.

The semi-elliptic springs have been designed for manufacturing from the flat bar and a reduction of scale lamination, due to one heat only in the manufacturing process, is thus obtained.

Guiding trucks and curving characteristics

The unusual truck-duty required for proper guiding effort has been taken care of by the introduction of a combination of hanger links and constant resistance rockers; the hanger links produce lateral resistance during the first part of the bolster travel, and the constant resistance rockers produce lateral resistance during the latter part of the bolster travel. The guiding characteristics with this combination show a low percentage of truck bolster load for the initial restraint against the bolster travel, this percentage increasing rapidly during the first part and reaching its maximum at about one-half the bolster travel when resistance is transferred from the hanger links to the constant resistance rockers. The unique construction offered by this combination besides giving very satisfactory guiding characteristics, protect the wheel hubs against the extreme wear usual with high initial resistance rockers.

Motor drive

Each cab unit is provided with two alternating current motors located between the driving and truck wheels at each end of each cab unit; making six motors for each locomotive with a total rating of 7,125 hp. The motors are geared to a jack shaft with a gear ratio of 4.76 and in turn connected to the driving wheels by rods working on crank pins in the jack shaft disc and driving wheel hubs.

Frames and crossties

The design of the main frames follows very closely the usual steam locomotive practice, except at the ends, where the jack shaft is secured in its pedestal. Each frame is 42 ft. 6 in. long and weighs, completely finished without pedestal caps, 18,450 lb. Six frames are required for each locomotive.

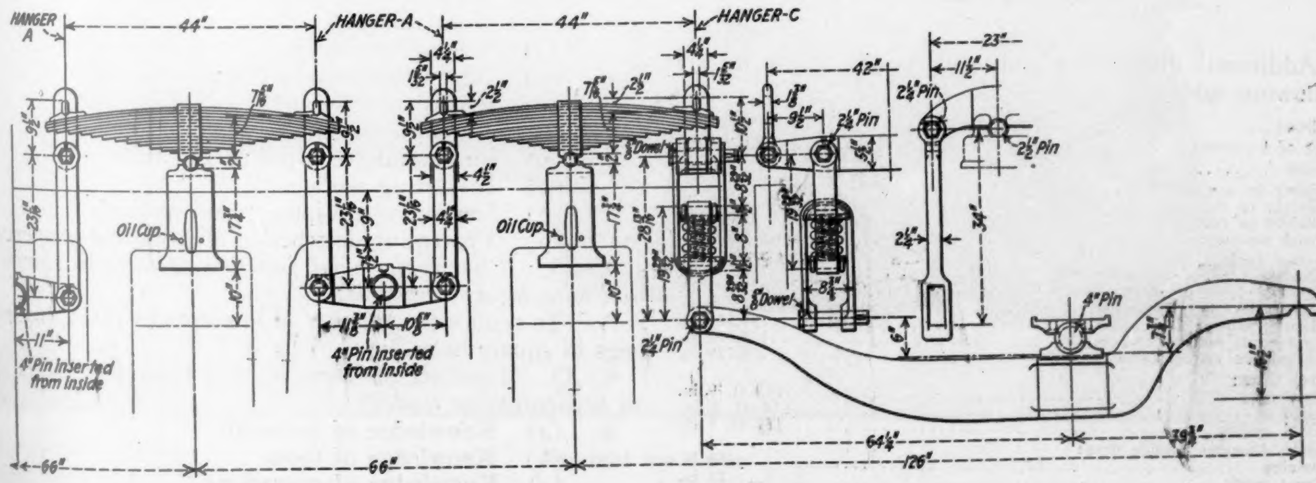
The frame crossties form an important part in the electric locomotive design, not only for their value in bracing the structure and providing supports for the electrical apparatus, but for the resistance which they offer to deformation of the frame when the locomotive is lifted, or jacked at the ends. For this purpose one continuous casting extending the full length between the motor supports is used.

The Virginian electric locomotive which has a tractive force of 900,000 lb. at 30 per cent maximum adhesion.

Draft gear

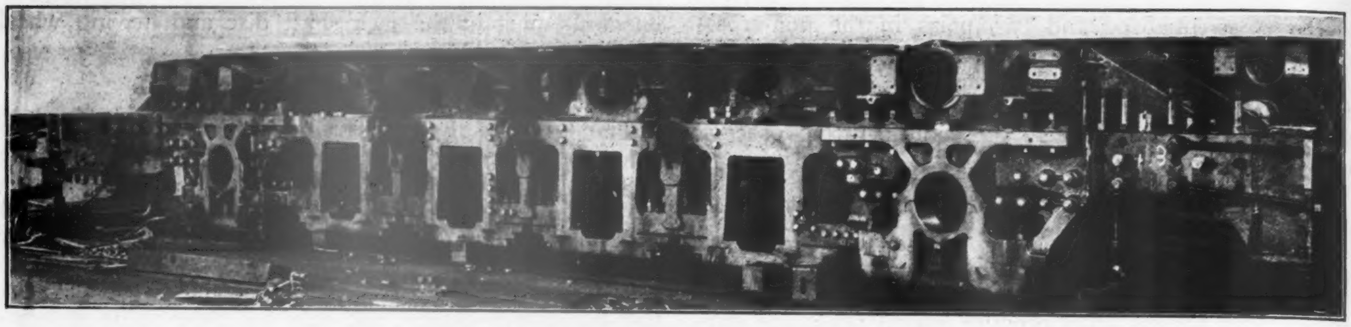
An improved Waugh draft gear capable of sustaining a bumping shock of 1,000,000 lb. and a tractive pull of 360,000 lb. is applied to the front and back of the three-unit locomotive. The draft gear housing itself forms a long radical drawbar and is anchored well back into the solid structure of the locomotive frame.

With the long radial drawbar coupled to the cars, the lateral movement of the coupler in road curves has less angular displacement between the couplers and, therefore,



—The spring rigging is a combination of elliptic and helical springs

less lateral reaction at the wheel flanges and track. The drawbar between the cab units is of the ordinary bar type with pin connections with similar characteristics and reactions at the rail as the floating draft gear at the front and back ends.



The frame crossties are an important part of the electric locomotive

The cab

The electrical equipment is protected by a sheet cab the whole length of the locomotive. The cab is arranged with an engineman's compartment at each end, partitioned from the main portion of the cab and provided with connecting doors, and the interior lagged with cork.

The roof of the cab is designed to allow the heavy electrical parts to be installed through hatchways to which water-tight covers are fitted. Windows and louvres are located to secure the best arrangement for light and ventilation for the electrical parts, which are located along the longitudinal center of the locomotive.

Guiding truck designed to protect the wheel hubs against extreme wear

Additional dimensions and weights are given in the following table:

Railroad	Virginian
Type of locomotive	Electric, 282-282-282
Service	Freight
Weights in working order:	
Weight on drivers	927,900 lb.
Weight on each truck	48,000 lb.
Total weight	1,275,900 lb.
Tractive force:	
Starting (25 per cent adhesion)	231,975 lb.
Starting (29.9 per cent adhesion)	277,500 lb.
Hourly rating (14.1 m.p.h.)	162,200 lb.
Hourly rating (28.3 m.p.h.)	94,500 lb.
Continuous rating (14.2 m.p.h.)	135,000 lb.
Continuous rating (28.4 m.p.h.)	7[illegible],750 lb.
Wheel bases:	
Driving	115 ft. 9 in.
Rigid	3-16 ft. 6 in.
Total engine	139 ft. 9 in.
Wheels, diameter outside tires:	
Driving	62 in.
Front truck	33 in.
Trailing truck	33 in.
Journals, diameter and length:	
Driving, main	12½ in. by 13 in.
Front truck	8 in. by 14 in.
Trailing truck	8 in. by 14 in.
Motors:	
Number	6
Volts	11,000 or 22,000
Gearing ratio	4.76

Supervisors answer questions about their responsibilities

A few months ago the 325 supervisors of the motive power and equipment department of the Delaware, Lackawanna & Western were asked to submit answers to what was designated as Questionnaire No. 1, the implication being that other questionnaires might follow. The following condensed summary of the replies was published in the February number of "The Lackawanna Supervisor":

Considerable interest in this questionnaire was manifested on the part of the supervisory body and many of the questions served as topics for discussion at the regular meetings of the various councils of supervisors.

1. Q. *What are the three elements the supervisor has to do with?*

A. "Men," "materials" and "equipment."

2. Q. *What are the chief responsibilities of the supervisor?*

A.
(*a*) Inducting new workers.
(*b*) Instructing workers.
(*c*) Constructively correcting workers.
(*d*) Help rate workers.
(*e*) Aid in fitting workers to jobs.
(*f*) Transferring and promoting workers.
(*g*) Securing co-operation.
(*h*) Securing and using suggestions.
(*i*) Maintaining cleanliness and order.
(*j*) Interpreting workers to management.
(*k*) Interpreting management to workers.
(*l*) Records and reports.
(*m*) Assigning and moving work.
(*n*) Maintaining equipment and tools.
(*o*) Inspecting work.
(*p*) Improving equipment and methods.
(*q*) Preventing destruction of work and property.

3. Q. *What is the chief function of tests in connection with hiring employees?*

A. To reduce the number of attempts to place "round pegs in square holes."

4. Q. *What are the three natural knowledge fields of an occupation or trade?*

A.
(*a*) Knowledge of materials.
(*b*) Knowledge of tools.
(*c*) Knowledge of operations.

5. Q. *In managing others, what is one of the most valuable accomplishments possessed by the supervisor?*

A. To get the other fellows viewpoint.

6. Q. *What weakness in a supervising official is never overlooked by the worker?*

A. Unfairness or lack of sympathy.

7. Q. *What are the causes of low production in all plants?*

A. 1. Failure of power.
2. Failure of equipment.
3. Failure of material supply.
4. Lack of proper instructions.
5. Lack of training of workers.
6. Personal slacking of workers.

8. Q. *What does the "planning the work" mean?*

A. 1. Thorough analysis of the piece of work to be done, a detailed statement of its demands, etc.

2. A full statement of specifications regarding how to proceed, or in other words method of procedure.

9. Q. *What steps must be taken before a supervising official can plan well?*

A. The following must be had:
1. Knowledge of factors involved.
2. A thorough analysis, that is, taking it to pieces and seeing what it includes.
3. Ample provision for conditions of whatever kind.

10. Q. *What are your opinions relative to the merits of rating workers?*

A. A rating system strengthens standards all along the line and eliminates the usual "snap" judgment policy generally found in industries. In a rating system pertinent data is made available to the management allowing for a definite program to be instituted, covering all branches of our company. This would not be possible were we dependent alone on the personal opinions of our various officials and supervisors, since discrimination for or against and biased opinions would be present.

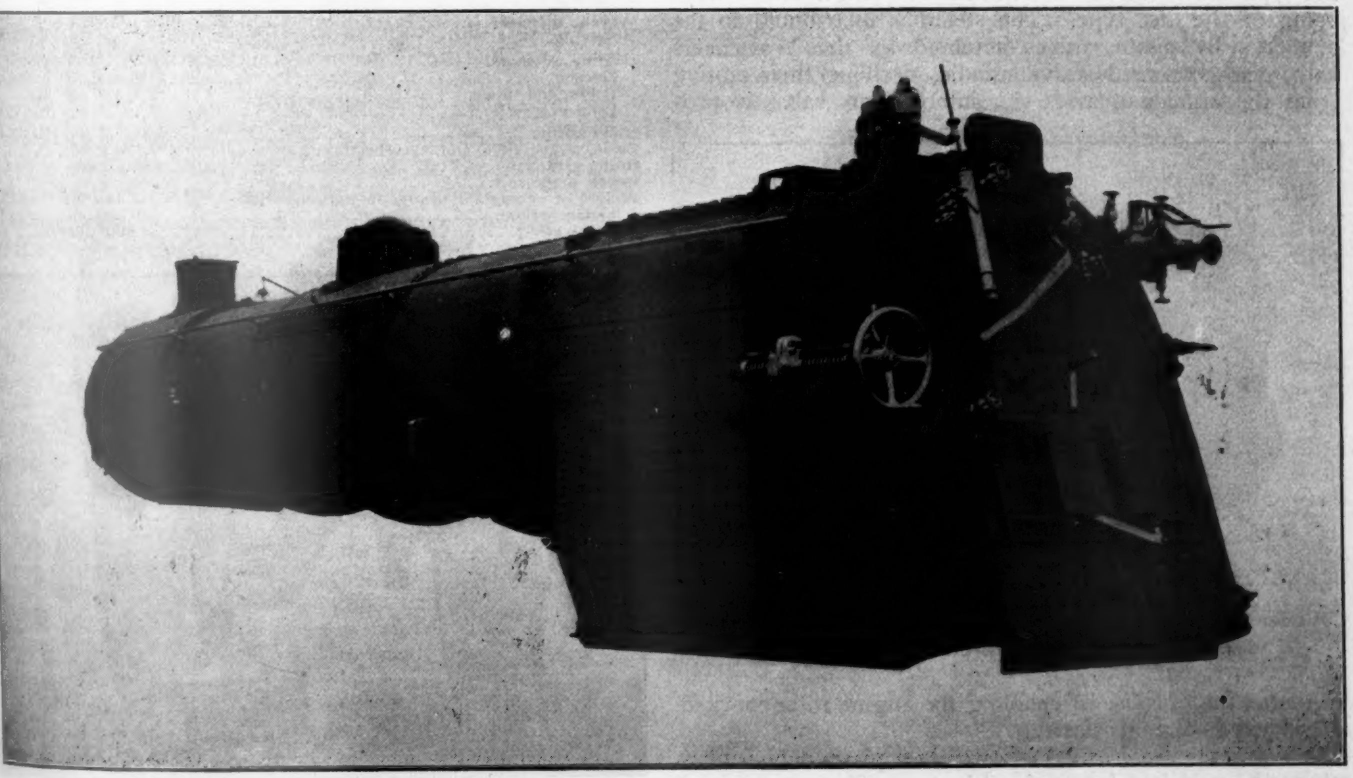
Compound locomotive for the Italian State railways

Mikado type passenger locomotive with 74-in. drivers—Tractive force of 34,300 pounds

THE accompanying illustrations show a new type of locomotive recently introduced for handling heavy passenger trains between Rome and Naples, and Rome and Florence, on the Italian State Railway, both of which sections include severe gradients. The locomotives rank among the most powerful employed up to this time on Continental railways for passenger service. The design was worked out by the locomotive department of the State Railways and built by the firm of Ernest Breda, Milan, Italy.

The boiler and accessories

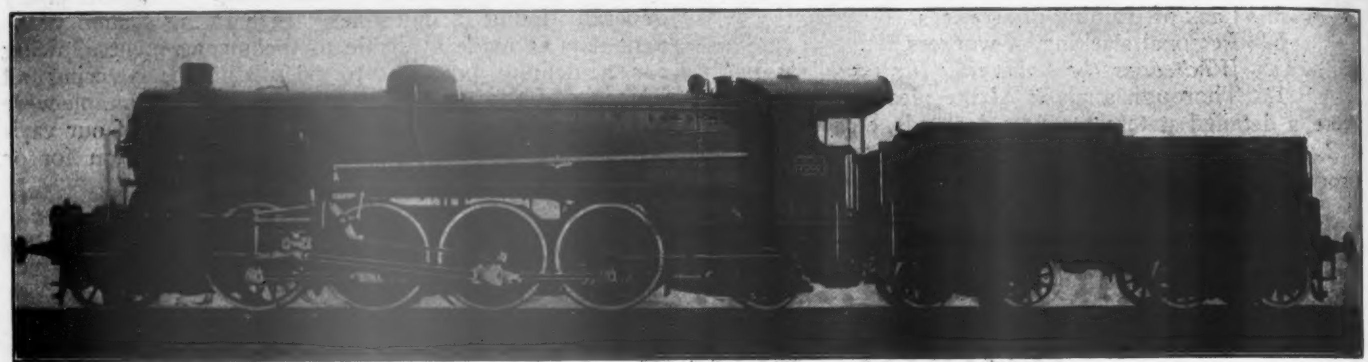
The boiler has a straight top with a slope on the bottom at the rear to give ample water space under the combustion chamber. The boiler is 77 ft. long and has a maximum inner diameter of 69 in. The steam pressure carried



Straight top boiler

is 200 lb. The total evaporative heating surface is 3,218.5 sq. ft. of which 183.9 sq. ft. is in the firebox and 3,034.3 sq. ft. in the tubes and flues. The superheater is similar to the Schmidt type and contains 721.2 sq. ft. of superheating surface in 27 double loop units. The interior shell of the wide type firebox is constructed of copper plates. The grate area is 46.29 sq. ft. with shaking grates operated by a compressed air grate shaker combined with a hand shaker.

The boiler is fed by two injectors. The boiler pressure is regulated by two 3½-in. safety valves. The locomotive is equipped with the Hasler speed indicator recorder with the instruments located in front of the engineman at the left side of the cab. A screw reverse gear is used.



Four-cylinder compound Mikado type passenger locomotive for the Italian State Railways

Engine and running gear

The 2-8-2 wheel arrangement is employed with 74 in. diameter wheels. In addition the locomotive is compounded, with four cylinders, the high pressure cylinders being placed between the frames, one in each section of the cylinder casting, and the low-pressure outside, all driving the third pair of drivers. The crank axle is of the type shown in the illustration, the single crank webs being of the disc type. The steam is distributed to the cylinders by piston valves actuated by the Walschaert valve gear, the inside valve spindles deriving their motion from the outside gears. An intercepting valve is provided for the purpose of enabling the engine to be worked single expansion at starting.

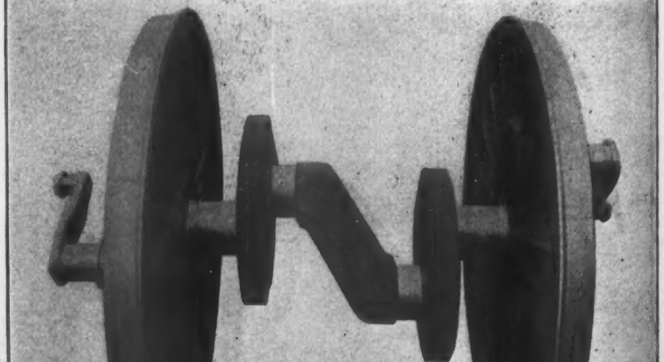
Cylinder castings showing the arrangement of the four cylinders in relation to the piston valve chambers

The frames are formed of two steel plates which constitute the principal longitudinal beams. These are joined together by two crossties and also by vertical and horizontal diaphragm plates. The spring rigging of the front drivers and the engine truck wheels are equalized together. The springs of the remaining drivers on each side are equalized together. The driver springs are all suspended under the driving boxes. The trailer truck is of the Bissel type with a lateral movement of 5½ in. on each side. The two truck springs are hung over the truck journal boxes. The locomotive is fitted with Westinghouse air brakes, a compressed air sanding apparatus and an electric turbo-generator.

The tender is carried on two, four-wheeled arch bar trucks with a water capacity of 5,812 gal. and approximately six tons of coal.

The locomotive, when running at about 46 m.p.h., can develop 1,600 hp., and, at 2,600 hp., can develop a speed of 75 m.p.h. The principal dimensions are as follows:

H. P. cylinder, diameter	19¾ in.
L. P. cylinder, diameter	29 in.
Stroke	27 in.
Weights in working order:	
On drivers	129,800 lb.
Total engine	205,027 lb.
Tender	109,338 lb.
Wheel base:	
Rigid	13 ft. 2 in.
Total engine	37 ft. 5¾ in.
Wheels, diameter outside tires:	
Driving	74 in.
Heating surfaces:	
Firebox	183.9 sq. ft.
Tubes and flues	2,313.4 sq. ft.
Total evaporative	2,497.3 sq. ft.
Superheating	721.2 sq. ft.
Comb. evaporative and superheating	3,218.5 sq. ft.
Grate area	46.2 sq. ft.
Boiler pressure	200 lb.
Weight of engine and tender in working order	314,365 lb.
Adhesion weight	129,800 lb.
Tractive effort	34,300 lb.



Built up crank axle located on the third pair of driving wheels

Lubrication and care of journal boxes*

By M. J. O'Connor

Special lubrication inspector, New York Central, Buffalo, N. Y.

SINCE the advent of friction draft gears, steel underframes, steel ends and solid steel wheels, car failures in trains have been reduced to the extent that today 90 per cent of the failures in freight trains are chargeable to hot boxes. The modification of the A. R. A. Rules, allowing freight cars to be loaded to axle carrying capacity, instead of the 10 per cent above stencilled capacity, compels the car department to use the greatest care in journal box maintenance.

The following methods and practices—which cover maintenance and construction—have proved very beneficial, and it is hoped by the writer, that the methods as outlined will be the means of bringing out further improvements which may exist on some railroad.

Journals

All journals should have a clean, smooth bearing surface; great care must be exercised in the finishing of collars and fillets to eliminate cutting edges.

Wheels on storage tracks should have journals coated with some suitable grease at all times, to avoid rust.

All boxes should be thoroughly cleaned—whether new or second-hand. Where new boxes are applied, it should be the practice to see that all scale and sand is removed. The cleaning of boxes is done very easily by the use of compressed air. Close-fitting dust guards should be applied in all cases where necessary, when removing wheels.

Experience tells us that, as a general rule, these bearings do not fit properly on the journals in the condition they are in when received from the manufacturer; in other words, the bearings have high spots, caused by shrinkage in the lining metal at the time they are lined in the brass foundries. This condition develops as the result of the lining being poured at a temperature 550 to 600 deg. F. and is exposed to an atmospheric temperature of 60 to 70 deg. F. The time consumed in pouring the lining is a prime factor in this respect. The unevenness of the lining in the bearings averages about 1/32 in. To overcome this condition and obtain a bearing that has a crown seat on the journal when applied, the best known practice is the use of a power boring machine to fit these bearings to the journals. The results in the use of this machine have been remarkably satisfactory.

When applying a brass on the journal, its surface should be given a coating of oil. The oiling of the brass consists of pouring from a special 1-pt. or 1-qt. sized can with spout. The oil is poured on the longitudinal side; then the bearing is tilted from side to side, after which the oil is allowed to run over the fillet or shoulder end. By this method we create an unbroken film.

Never wipe the face of the brass or journal with oily or dry waste.

Center plates and friction side bearings

When trucks are assembled or removed for repairs, before replacing them, a suitable lubricant must be applied to the center plate and friction side bearings.

Relining of journal bearings

Bearings found in the following condition when removed from journal boxes should not be relined:

1—Where end wear is more than 1/16 in. on either end.

2—Where the extension back of the lug is worn more than 1/16 in.

3—Where the back or sides show indications of wedge wear—be it only 1/64 in.

With reference to the third cause: We must realize that it is necessary to rebore the bearing side of all brasses, in order to obtain a clean surface, so that the lining will properly adhere to the brass back. Furthermore, when it is considered that the standard thickness of a brass back, when it is new, is only ⅞ in., and we bore out 1/16 in. to get a clean surface, when relining, it can be readily seen that any signs of wedge wear further reduces the thickness and at the same time creates a more weakened condition of the brasses. The relining of all bearings, as outlined, should be done by a brass manufacturer who is fully equipped to perform this class of work.

Journal bearing wedges

This is one of the most important features in connection with the contained parts of journal boxes. Therefore, careful examination should be made of their condition each and every time a brass is changed. For example, a

*Abstract of a paper read before the April meeting of the Car Foremen's Association of Chicago.

9-in. wedge, when new, has a 78-in. radius, which is equivalent to 1/16 in. crown, and it is this crown that properly distributes the weight of the load on the brass, at the same time allowing the brass to slide laterally with the wedge. When the crown is worn flat the wedge does not function properly, as it retards the lateral movement of the brass, with the result that when the bearing reaches the point where the entire surface rests on the journal, the wedge commences to take a permanent set on the brass about ½ in. from the collar end, causing another hot box. It is very desirable that we give as much attention to the condition of the wedge as we do to the condition of the journal bearing when a change of brass is necessary. The drop-forged steel type of solid back wedge is very serviceable.

Periodical repacking of freight cars

The discontinuance of periodical repacking of journal boxes on foreign cars for compensation must have had its good reason, although I feel it should have remained one of the requirements of the rules, as much so, as the periodical cleaning of air brakes, and for this reason, would recommend a proposed new Rule 66 to read as follows:

Journal boxes not repacked within 12 months as indicated by the stencilling on car body.

The date and place (railroad and station) where the work is done must be stencilled on car body near body bolster at diagonal corners in one-inch figures and letters, using the same station symbol as used for air brake stencil.

To justify charge all of the old packing must be removed and boxes cleaned; boxes must be jacked, the bearings and wedges removed for examination and renewed where necessary. Properly prepared packing (new or renovated), must be used and the work done in accordance with A. R. A. recommended practice adopted in 1920.

(Note)—Dust guards must be examined and renewed (if necessary) when wheels are changed.

It will be noted that a safeguard has been placed in this rule to justify the charge.

Periodical repacking of freight cars

It has been found that the removal of journal bearings and wedges for examination is of the utmost importance when boxes require renewal of journal box packing. During the past year this has been fully demonstrated because in repacking more than 50,000 freight cars, the stencilling on which indicated such cars had not had the bearings, wedges and packing examined anywhere from one to four years, it was found necessary to renew 25 per cent of the journal bearings on all such cars on account of the following defects:

The extension back of the lugs—½ in. wide when new —was worn ¼ in. on half the bearings renewed. This condition had distorted the brass back to such an extent that the babbitt metal had been drawn over the longitudinal edge of the bearing.

One-quarter of the bearings renewed were removed on account of excessive end-wear. When we say end-wear, this indicates a wear on either end of more than ⅛ in.

One-quarter of the bearings renewed were removed on account of worn through lining and lining cracked; this condition being due principally to mongrel types of wedges, as well as solid wedges worn flat. In other words, these wedges were not functioning properly.

The method of preparing packing with the ratio of four pints of oil for each pound of dry waste, is in my opinion, universal. So we will now go into the matter of saturation. Saturation consists of forcing the air out of the waste fibres and the oil in. Therefore, it is necessary to heat the oil to some extent in order to create expansion, so it will work its way into the waste, forcing the air out. This makes it necessary to keep preparation and storage tanks hot at all times. All tanks—whether used for preparation or storage—should be made of metal, for the reason that metal is a conductor of heat, and wooden vats and tubes are not.

The use of prepared rolls in the back of journal boxes is very valuable. These rolls are 2½ in. in diameter and 10 in. in length. The intent of the rolls is to better exclude the dirt and keep the oil in journal boxes, and not to lubricate the journal. Therefore, precaution should be used in properly placing the roll at the back of the journal box to avoid one of the ends working upward against the journal at the shoulder.

Method of applying journal box packing

Place the roll in the mouth of the journal box, work it back under the journal to the extreme back of the box, leaving it in such a position that it does not extend above the center line of the journal. The rest of the packing should then be placed under the journal firmly so as to prevent settling away. This is best accomplished by placing the packing across the full width of the mouth of the journal box and allowing the strands to hang down outside, always adding more packing before placing the hanging strands inside the box. This has the effect of binding all the packing in one mass. The packing must not extend above the center line of the journal or beyond the inside face of the collar.

The method of packing journal boxes, as outlined, is the best known preventive of the so-called waste grabs, which is the cause of more than 50 per cent of the hot boxes on freight equipment.

Care of packing in journal boxes

The most important part of the work for successful lubrication of equipment, is intelligent attention to the condition of the packing in the journal boxes in train yards. The handling of this work consists of placing the packing iron along the sides of the journal box, then pulling the packing forward from the sides and working it back under the journal at the center; if additional or new packing is required, it should be worked back under the journal from the center, care being taken that it is not lifted above the center line of journal on either side.

The handling of this feature, as outlined, has produced splendid results, particularly in journal boxes where the so-called front plug is *not* used. It is a very difficult matter to maintain packing below the center line of the journal where the front plug *is* used, as it seems to be second-nature with car oilers to force it under the journal.

The practices which have been outlined can only be accomplished where standard printed instructions in book form exist, plus standard tools and equipment, as well as a supervisor, to follow the matter at all times.

Furthermore, we all realize that there have been suggestions, recommendations, and many good points brought out with a view of protecting equipment from giving trouble, and running hot by new devices, but we all feel, I think, without question, that our present method of lubrication is one that will continue with us for some years to come. Such being the case, let us all work together to bring it to the very highest standard.

THE BOSTON & MAINE, in an effort to further increase its fuel savings, which amounted to 42,236 net tons in 1925 as compared with 1924, has established a budget system, by which coal consumption is measured by operating divisions in tons and pounds per unit of service, just as the general expenditures of the road are budgeted in dollars and cents. Each division superintendent is responsible for his share of the coal budget, the figures of which have been based on a reduction of five per cent from the consumption unit of last year.

Century of car manufacturing progress*

Comparison of methods used in 1835 with those of today—Progressive steps for manufacturing a composite box car

By George A. Richardson

Manager, technical publicity department, Bethlehem Steel Company, Bethlehem, Pa.

NINETY years ago, or, to be exact, in 1835, three ambitious young men made an extensive and exhaustive investigation of the methods then used by manufacturers of stage and railway coaches throughout the New England section. Railroads still were a new, though a promising possibility. They found that most of the shops were merely frame sheds in which the rough, old-fashioned four-wheel cars were being constructed.

As might be surmised, all three young men were of a progressive turn of mind. They believed there was room for marked improvement in the more or less primitive methods of building the equipment, as well as in the arrangement of the plant required. Two of the young

Interior view of the forge shop at the Cambria car plant

men, Mahlon Betts and Samuel N. Pusey, formed a partnership for the purpose of building railroad cars. This was in 1836. Erection was begun on a three-story brick building at the corner of Front and Tatnall Streets, Wilminton, Del., and production soon started. A year later, Samuel Harlan, Jr., who had been the third member of the investigating party, was taken into partnership.

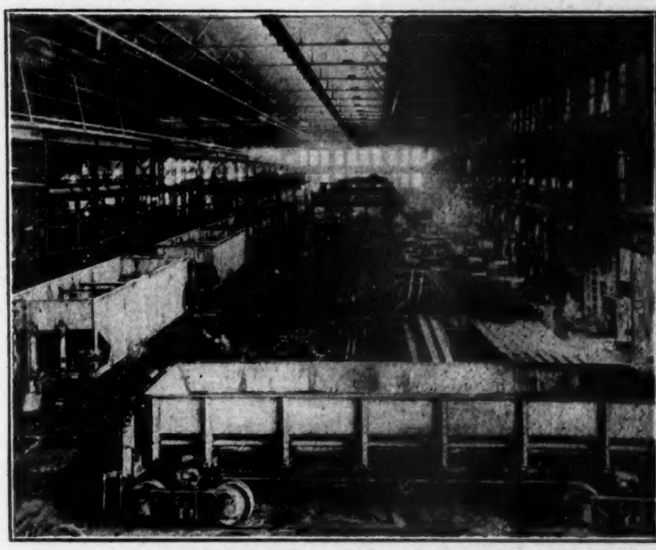
This was a period of transition. The original idea of using modified stage coaches for cars was being gradually discarded and, within a couple of years, we find the beginning of the modern style of car building.

Facilities of one of the first car manufacturing shops

The new building erected by the partners little resembled a shop used today for manufacturing railroad cars of any kind, and yet it sufficed to take care of the available business of that time and was considered an up-to-date plant. In the basement were placed the blacksmith fires, at which the iron was forged for the cars which were built on the upper floors. Here, also, the trucks were framed and finished in a small area divided off from the rest of the floor space. On the first, second, and third floors the business of car building was carried on in all its branches. The few woodworking tools of the day, with work benches, were distributed mostly about the second floor, while the upholstery room and other divisions of the business occupied the remaining spaces not required for the erection of car bodies.

The floor of the second story of this shop was laid in large traps, through which the completed cars were lowered by blocks and falls to the ground floor where they were painted and varnished for delivery. The entire building was 60 ft. wide by 100 ft. long, but the standard car length of that time was only about 32 ft. so that plenty of room was available.

The new firm built in the first couple of years of its ex-



Interior view of car shop No. 2, located at Jonhstown, Pa.

istence 109 four-wheel cars and 67 eight-wheel cars, a good record considering the facilities available, but one that, considering the size and design of the cars, would amount to little today. The plans were little more than rough water color sketches bearing, for the most, a few major dimensions, everything else being left to the builder. This concern not only made a bid for local business, but also published a very elaborate circular in 1839 for the purpose of advertising to foreign countries, and were suc-

* Abstract of a paper presented before the February 12 meeting of the St. Louis Railway Club.

cessful in acquiring considerable export business also.

From these early pioneer days to the present, as a result of a rapid increase in tonnage and the consequent problems confronting the railroads, the change in type and capacity of equipment has been going on continuously and even at the present much is being done in the way of simplification, efficiency and increased carrying capacity of the equipment.

Unit production, by necessity, has given way to mass production, and this is particularly true in the case of freight cars. As a matter of fact, we find it desirable to segregate passenger car work because of its highly specialized character and demands for finish, which call for a great amount of time. Hence, we find that the old firm

The method of riveting the underframe of a steel box car

of Betts, Pusey and Harlan, which, after passing through several changes in organization during the course of which it was known for a long time as Harlan & Hollingsworth, was finally acquired by the Bethlehem Shipbuilding Corporation in 1911, and came gradually to specialize on passenger car building, and still continues to do so.

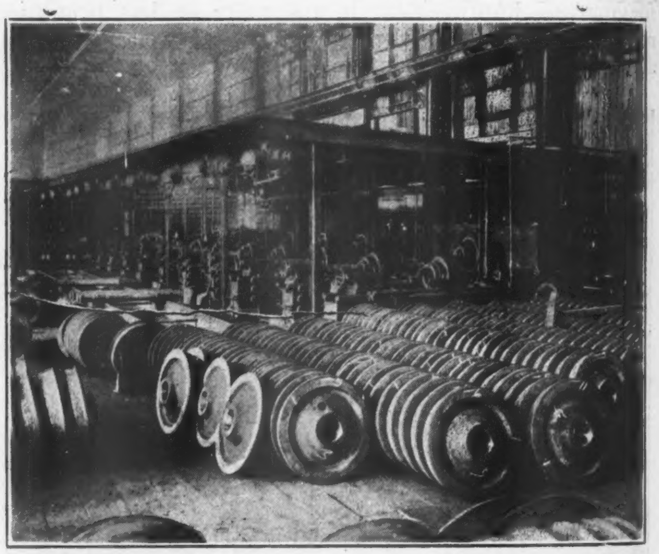
Essential factors to be considered in a modern manufacturing car plant

The freight car is one of the big factors in railway transportation, and it is in the building of this equipment that the problem of mass production is the most important. The present generation remembers 20 and 30-ton capacity cars, and the rapid change from those to the present types of 50, 70 and even 100 and 105-ton capacities in some cases. Notwithstanding this great increase in car capacity, the total number in service has increased much more rapidly.

Started about 25 years ago, the productive capacity of the Cambria car shops located at Johnstown, Pa., has increased until today nearly 100 cars of various kinds can be built every 24-hour day. Originally the work was confined to steel cars of certain types, but with the changes in capacity, provision has been made to handle any type of car for freight service, whether all-steel, wood or composite. Low cost is a result of mass production. Most persons are familiar with the production methods in the automobile and similar industries, but do not consider the building of freight cars a problem of mass production. It is a matter of fact, however, that methods prevail in the building of freight cars identical with those in the manufacture of automobiles, modified only to meet local conditions.

Proper facilities for the storage of materials are important. The flow of materials must follow the same channel regardless of the type of car being built. The endeavor of a large producing organization giving its time and energy to the single purpose of freight car production can be likened to an automatic machine in which each movement follows the preceding one with regularity and exactness. Starting with immense stores of raw materials, many hands and numerous machines transform the inert masses into a symmetrical and useful commodity.

In the modern car shop one witnesses a feat which is impressive. One sees the various parts moving rapidly together and combining with the regularity of clock work into one whole in a length of time almost inconceivably short. Imagine for a moment that in the Cambria car shops one freight car is completed every 15 min. during the working day, and that this rate is kept up day in and day out during the entire time the current order lasts. It is fascinating to see the various parts going together and moving from position to position. Starting from the very beginning the immense piles of raw materials are transformed into trucks, underframes, bodies and complete cars with a dispatch that would have seemed marvelous 20 years ago. This rapidity is due to a complete and careful subdivision of work into position operations and the concentration of the maximum amount of labor that can be used most economically in every position. Often 1,000 men are employed in the two erection shops at Cambria.



The axle turning department is covered by an overhead structure which carries an electric monorail and hoist for every machine

The Bethlehem Steel Company is in a unique position as regards the manufacture of cars, because it is the only plant of its kind in the country that produces the materials for car manufacture, as well as building the cars themselves. This includes such diversified products as bolts, nuts, rivets, plates, shapes, rolled steel wheels, axles, and pressed and drop forged parts.

The entire car shop division has been laid out with a view to obtaining, as nearly as possible, a constant flow of material from the production and assembling divisions to the erection positions. Not only this, but the splendid results which are being obtained today are the outcome of a well thought-out, systematic and scientific plan of action in which numberless striking changes in methods have been introduced.

Various units of the Cambria car shop

One of the very important units is that made up of the

axle-finishing and truck building departments. These departments produce essential units, which, together with parts from other sources, converge to a common center where the cars are erected. An interesting feature is the housing of these departments and, particularly, the storage of the various parts used by them of which we mention axle, side frames, bolsters, etc. All this material is placed under cover. The housing consists of a modern steel and brick building 90 ft. wide by 740 ft. long, which affords ample space for the storage of all parts and of all machines entering into the manufacture of the trucks.

Approximately one-half of the total area of this building is given over entirely for storage purposes. A standard gage track extends the entire length of the building

The jig used in building the underframe of a steel box car

and has a capacity of 15 freight cars at one time. Three 10-ton overhead traveling cranes provide the necessary facilities for unloading material directly from the cars to the stock piles without rehandling.

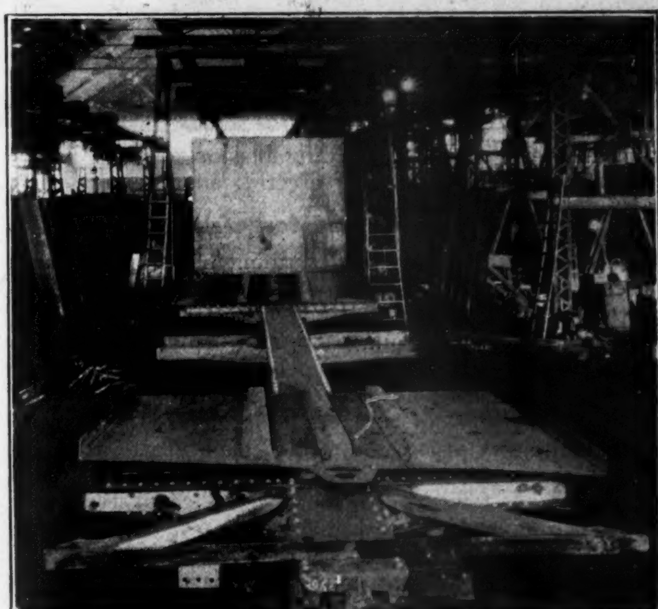
The various parts are piled in a safe and orderly way. The storage space is equipped with beds made from heavy 20-in. I-beams set in the floor. These steel beams afford a suitable foundation for storing heavy material. It has been found that these beams will just fit a 33-in. freight car wheel when the wheels are piled within the flanges of these beams. This method of piling guarantees the alinement and stability of the wheel piles and at the same time makes it possible to build up very high piles, thus giving a large storage capacity with minimum use of floor space.

The beam beds also afford an excellent foundation for the piling of axles, side frames, truck bolsters and other material entering into truck construction. When axles are being stacked, hardwood stringers are inserted between the layers, with bent steel flats placed at the end of the piles, thus allowing each layer of axles to be of the same length. This method prevents the slipping or rolling of the axles and allows them to be piled high with safety even though the ends of the piles are vertical. Wood stringers are also used in the piling of side frames, bolsters, etc., as a regular practice in order to make the piles safe. As an additional precaution, a slight camber is given to the piles by the proper placing of the stringers.

As a result, one will find an unusually orderly appearing storage layout not at the expense of, but in conjunction with the very decided advantages of increased safety. Greater storage capacity has been provided. Another feature which has not yet been mentioned is the ease of taking inventory. Passageways are provided between the various piles, and this makes it possible to take inventory very rapidly and accurately.

Method of handling axles

The axle-turning department is provided with 12 modern axle finishing lathes. This department is covered by an overhead structure which carries an electric monorail and hoist for every machine. The rough-turned axles are deposited by cranes on a storage bed from where they are transferred by the above-mentioned hoist into the lathes. As the axles are finished, they are transferred directly from the machines to another storage bed at the head end of the lathes by the same hoist. Here the axles are inspected, gaged and rolled to the end of the bed where the wheels are loose-mounted on the axles by means of a monorail and suitable hoist. The assembled wheels and axles are then rolled from this position on steel floor plates of suitable width to a 600-ton mounting press. After the final mounting, they are rolled to the end of the truck building bed where they are picked up by a small hoist and deposited on rails for the final truck assembly. An important aid in securing production in cold weather is the provision of ample heating facilities which are particularly necessary on account of wet cutting. The indoor storage of the axles and other parts is also a very decided advantage during the winter months. It is a further source of saving time because the workers do not have to contend with the parts being covered with ice and snow, which would be the case when outdoor storage is used.



Sixth erecting position—After the transfer of the underframe the steel ends are applied in this position

Car wheels are finish bored, gaged and marked in this shop. Properly selected wheels are then rolled to the end of the axle finishing bed, where they are loose-mounted on the axles, as described above.

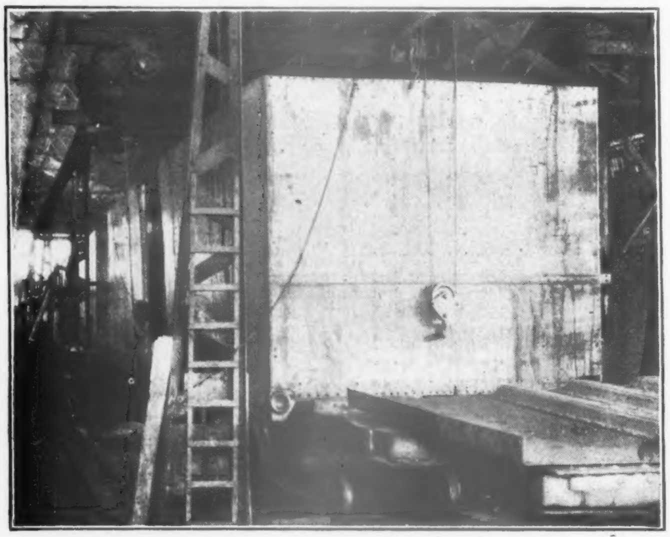
The truck building

The truck building bed is mounted on a cement foundation with heavy I-beams supporting the rails. The top of the rail is approximately 17 in. above the floor lines, which affords a comfortable height for the truck builders. The bed is built on a one-half of one per cent grade, which permits of an easy movement of mounted wheels and trucks. At the end nearest the wheel mounting press double rails

are provided, which permit the over-lapping of the mounted wheels, thus giving greater capacity per unit of length. As the mounted wheels approach the point where the truck building begins, these double rails converge to a single rail system by means of an automatic switch.

Side frames, spring planks, bolsters, etc., are assembled on beds adjacent to the building track and the completed truck frames, which can be considered as a subassembly, are then swung onto the building bed by means of overhead jib cranes and electric hoists.

On the building bed the trucks are assembled and fitted under a position system, constantly approaching the exit where, after the journals have been packed and the trucks



Seventh position showing the erection of the sides and ends

inspected, they leave the building bed on a sharp incline and roll by gravity to the car erecting shop.

Bolt and nut and forge shops

Space does not permit of describing in detail the work and equipment of the bolt and nut and forge shops. Suffice to say that everything is laid out in a manner to insure the most efficient operation, and some very unusual jobs have been and are being performed. One interesting example of drop forging practice is the making of drop forged steel center plates under a 27,000-lb. hammer. In the way of pressed steel parts a great variety of unusual shapes, normally made as forgings, have been developed. A few of the more complicated types are pieces such as pressed steel striking plates, bath tub bolsters, posts of various kinds, etc.

The bolt and nut and forging departments are not only laid out with a view to securing a plentiful and uniform flow of material, but at the same time they are prepared to handle outside jobs in addition to the work normally called for in the operation of the plant.

Operations in the erecting shop

While the preparation work is going on, the cars are being erected as rapidly as possible in the erecting shop. Two sets of erecting tracks are used in the steel shop, so that two cars are being built simultaneously. The cars are moved up one track and down the next, so that the complete body is built in 12 positions. It is then so located that it can be lifted by a crane to the trucking tracks where it is placed on the trucks. The routine of assembly followed in building a steel box car with inside wood lining is as follows:

Position 1—Units for center sill assembly are brought together here and riveted.

Position 2—Center sill is assembled and mounted on building trucks.

Position 3—Crossbearers, bolsters and end sill diagonal braces are applied.

Position 4—Riveting position. Above parts riveted.

Position 5—Draft gear, couplers and miscellaneous parts of underframe applied.

Position 6—Riveting position. Also turnover position. Underframe is turned over in order to complete riveting of all of the assembled parts.

Position 7—Ends and sides assembled. Door jig applied. Body squared up.

Position 8—Application of roof.

Position 9—Riveting position.

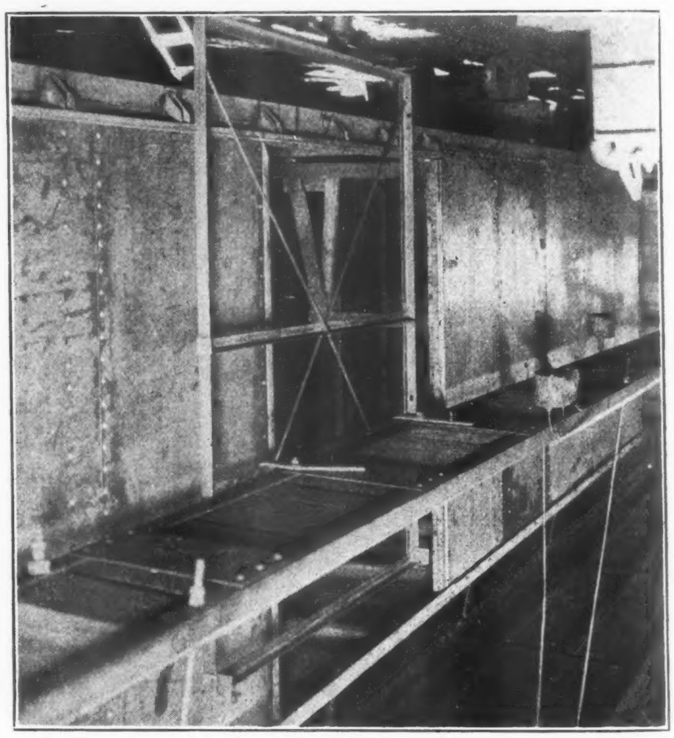
Position 10—Riveting position.

Position 11—Doors applied.

Position 12—O. K. position. In this position all work is carefully inspected, defective rivets replaced and such other corrections made as may seem necessary. The body is carried by a crane from here to the trucking track.

Positions 13 *and* 14—Trucking track. The body is placed on trucks, air brake applied and inspection of air brake.

The car is thoroughly cleaned by washing. A first coat of paint is given inside and out. This includes roof and the spraying of the trucks. The body is then ready for the wood application, which in the present case consists of a wood floor and single lining, extending to the top of the car. This is done in the wood erecting shop where wood working machines prepare the lumber. All parts to be applied to the car are made in this shop, including running boards and card boards. These all receive a coat of paint before being applied to the car.



Eighth erecting position of the building of a wood lined steel box car, showing the jig for the correct application of the door posts

Here again position work is an important factor in securing production. The cars are brought from the steel shop and enter the wood erecting shop at the lower end. The cars are moved forward from position to position as follows:

Position 1—Lay flooring. This is more difficult in the present car than normally would be the case, on account of the necessity of having to cut and trim around the posts in order to make a tight joint. One of outstanding features of the handling of this job in the Cambria shops is the care taken to get an absolutely tight floor. About every four feet the boards are wedged into place and held

by bolting down one board. The first gang of men lays the floor as far as the door posts.

Position 2—Continuation of floor laying. Threshold or door opening boards placed. This work is performed by a second gang which follows right on the heels of the first. This gang lays the boards in place and wedges them apart at the center. The loose boards on both sides are cleated temporarily and the resulting gap is measured. A board is then planed to a width about ⅛ in. wider than the width of the gap. The wedges are removed. The two cleated groups of boards are lifted to a pyramidal position, the key-board inserted, and then, with the aid of large levers, the flooring is forced into place. In this way a tight fit is obtained.

Position 3—Laying out floor for drilling for floor bolts. This is done by a layout boy with the aid of templets.

Position 4—Drilling holes for floor bolts. Two drillers with electrically-driven drills do this job.

Position 5—Placing and tightening up floor bolts. After the holes have been drilled, two men apply the bolts. At the same time a gang underneath the car is aplying the nuts and screwing them tight.

Position 6—Grain sealing. This is done to prevent any possibility of grain leaks. A worker pours a hot asphaltum base sealing compound all around the edges of the flooring. He is followed by another man with a hot calking tool which is used to push the excess compound back into place. This is done with a special tool provided with a light and an electric heating coil, which heats the compound to the desired temperature.

Position 7—Apply posts. This job consists in applying the side posts and bolting them up. The gang, consisting of six men, applies over 600 posts in 10 hours, or, in other words, an average of more than one post a minute.

Position 8—Side lining boards and end lining boards are applied and wedged into place. Nailers follow and nail the boards.

Position 9—Door post facers apply posts and bolt them in place.

Position 10—Cleaning and inspection. The car is swept out and a company inspector goes over the whole job carefully.

While this work has been going on inside the car, the running boards and card boards have been applied to the outside. It should also be borne in mind that while all work is inspected by the shop's inspector, it is also constantly being inspected by the railroad company's representative.

From the wood erecting shop, the cars are transferred to the paint shop where they receive a second coat of paint. They are stenciled again, offered for inspection by the railroad inspectors, given an air brake test and finally shipped out.

While position work is a large factor in speeding up mass production, it should be borne in mind that the secret of the uniform and rapid rate of production obtained at Cambria shops without sacrificing quality, is in some measure due to the use of jigs and templates. One will find an extensive use of jigs in the manufacture of roofs, doors, bolsters, running boards and other parts, so that every part fits corresponding parts without any time being lost in fitting and adjusting. Even the quarter sections of the sides are jigged.

Another factor which makes for large production and at the same time makes it possible to make a product of high grade is the extensive use of gage and multiple punches.

Although time did not permit of any description of the facilities of the tank car shop, it is interesting to know that among the more interesting and unusual equipment available are two 23-ft. bull riveters and a set of bending rolls which are used for rolling plates. The top roll, which has a length of 48 ft., weighs 73 tons.

Preparing trains for the descent of grades*

By W. G. Peck

Supervisor of air brakes, B. & O., Baltimore, Md.

THE Baltimore & Ohio, serving the mountainous sections of Pennsylvania, West Virginia and Maryland, occupies the unique position of having more heavy grades than any other railroad in this country, if not the world. There are actually 170 grades of 1 per cent or greater, one mile or more in length, on the 5,196 miles of road comprising this system.

The main line of the Baltimore & Ohio divides at Cumberland, Maryland; one road going northwest to Connellsville, Pittsburgh, Cleveland and Chicago; the other bearing due west to Parkersburg, Cincinnati and St. Louis. Cumberland is at the foot of the mountains and has an elevation of slightly over 600 ft. The west end of the Cumberland division is on the line to Cincinnati, and extends from Cumberland to Grafton, W. Va., a distance of 102 miles. There are two heavy grades on this line sloping eastward in favor of traffic, known as Cheat River Grade and 17-mile Grade. Cheat River Grade is 4¼ mi. long, the gradient ranging from 1.9 per cent to 2.1 per cent—17-mile Grade ranges from .6 per cent to 2.28 per cent.

The Connellsville division extends from Cumberland to Connellsville, Pa., a distance of 92 mi. The heavy descending grade slopes eastward in favor of traffic. It is known as the Sand Patch Grade and is 19.5 mi. long. The ruling gradient for this portion of the line is 1.7 per cent.

Coal is the principal commodity hauled on these divisions. Coal trains on the Connellsville division average about 70 cars in length. On the Cumberland division, about 35 loads of coal is the limit, due to the heavy ascending grades which must be negotiated. Trains of meat, stock, grain, structural steel and merchandise are hauled up to 100 cars in length. Traffic is normally congested on both divisions.

Prior to the year 1919, these trains were all handled down the heavy grades with air brakes supplemented by hand brakes. On coal trains, from 50 per cent to 75 per cent of the hand brakes were used. On trains of lighter lading, a smaller percentage of hand brakes were used, although not in direct proportion to the weight as the allowable speeds were higher.

In the spring of 1919, six tests runs were made on each of the Sand Patch and 17-mile grades to determine the feasibility of handling trains without the use of hand brakes. The first test on Sand Patch Grade was made on March 27, with train No. Extra East 4267, loaded with grain, 71 cars. A total of 127 man-hours was required to prepare the brake equipment on the cars. Each brake was required to pass a two-minute retaining valve test.

Following is an itemized list of repairs and material

* Abstract of a paper presented at a meeting of the Cleveland Steam Railway Club, April 5, 1926.

used in connection with putting the air brakes in suitable condition:

5 Packing leathers applied.
3 Triple valves applied.
15 Retaining valves applied.
6 1-inch union gaskets applied.
10 1-inch union gaskets tightened.
29 Brakes adjusted on account of improper piston travel.
15 Air hose applied.
12 Air hose gaskets applied.
1 Cross over pipe repaired.
4 Cross over pipes tightened.
10 3/8-in. unions tightened.
6 3/8-in. unions applied.
4 Retaining pipes tightened.
2 Retaining pipes renewed.
3 Angle cocks applied.
3 1¼-in. couplings applied.
3 1¼-in. couplings tightened.
1 Dead lever guide applied.
12 Cotter keys applied.
1 Air brake pin applied.
1 Pipe clamp bolt applied.
1 Brake chain applied.

The first test run made on 17-Mile Grade was known as Extra East 7124, April 15, 1919, with 70 loads of coal. It required a total of 175 man-hours to prepare the train and the following work was performed:

14 3/8-in. union gaskets applied.
37 Air hose applied.
4 Packing leathers applied.
34 Retaining valves applied.
7 Air hose gaskets applied.
4 1-in. union gaskets applied.
2 1¼-in. union gaskets applied.
2 3/8-in. unions tightened.
5 Angle cocks applied.
1 10-in. cylinder gasket applied.
1 1-in. union applied.
1 1¼-in. sleeve applied.
1 Set 1¼-in. threads cut.
1 Triple valve cap tightened.
14 Brakes cleaned, oiled, tested and stencilled.
3 J-M expanders applied.
1 Brake cylinder head tightened.
4 1-in. nipples applied.

After the twelve test runs were completed, it was found that power brake operation at Connellsville would cost $1.50 per car, and at Grafton $2.00 per car. Labor was then figured at 55 cents an hour.

Notwithstanding the heavy expense involved, and the fact that level-grade roads could not be forced to assist in bettering air brake conditions, power brake operation was gradually started in 1920 on Sand Patch Grade. Seven hundred and thirty-eight trains were prepared for power brake operation out of a total of 4,290. During 1921, 3,178 trains out of a total of 3,967 were specially prepared for power brake operation on Sand Patch Grade. During 1922, this increased to 4,484 out of 4,683. Power brake operation descending 17-Mile Grade was inaugurated early in 1923. During that year 11,080 trains out of a total of 11,339 were handled by power brakes alone. During 1925, 32,830 trains comprising 1,390,952 cars descended the heavy grades on these two divisions without the use of hand brakes. Four trains failed, that is to say, something occurred en route which led the crews to set a few hand brakes. There has been but one runaway under power brake operation and this did not result in a derailment. One of the grades mentioned starts in the middle of a long tunnel. A passenger engine was being broken in on a freight train. The engineman listening to the exhaust of his high-wheeled locomotive in the tunnel turned the summit at about 15 m.p.h. too fast. He applied the brakes leaving the tunnel, whistled for hand brakes when he realized the excessive speed and was stopped in something more than a mile.

As to the cost of preparing the cars for the descent of these grades and the number of carmen required in the transportation yards for this work exclusively, the latest figures available are for February, 1926, when the net cost per car was less than eight cents. A total of 58 carmen are used, divided among four stations. All trains descending Sand Patch Grade must either pass through Somerset, Pa. (which is on a branch line) or Connellsville. Trains descending 17-Mile Grade are prepared at Grafton or Fairmont, W. Va. When prepared at the latter station, they are main-tracked through Grafton.

It is not necessary to prepare each individual car in these trains. It was found by experiment that 120 tons per good mountain brake could be handled down Sand Patch and 95 tons down 17-Mile Grade with a good factor of safety. If the tonnage per good mountain brake exceeds this, the train crew will refuse the train until further repairs are made. For our purpose, a good mountain brake is considered to be one that, with the retaining valve handle in holding position, the brake will be held applied for 2½ minutes and a good blow of air will exhaust from the retainer when the handle is turned down.

The method of performing the work on the car is as follows: After train is made up, each carman is assigned an equal number of cars, for which he is responsible. The yard air line is connected and the train thoroughly charged. While this is taking place the men inspect for brake pipe leaks and make a general visual inspection. When these defects have been corrected, retaining valves are placed in holding position and brakes fully applied in service. A whistle is sounded as a signal to the men. The brakes are immediately released. Each carman times with his watch for 2½ minutes after the nearest retainer vents and then starts over his cars turning down retaining valve handles. Those giving a good blast of air are left with the handles down, while those giving a weak blast, or no blast are considered ineffective brakes and the handles set up again. The men are allowed to turn down retainers as the triple valves are being moved to application position. They wait again for 2½ minutes before they resume the turning down of handles. This procedure is kept up until a signal is passed to the man at the yard line connection that the test is complete. Each car passing the test is marked with crayon at the retaining valve showing station and date. Work is then started on the individual brakes which did not pass the test, or that required piston travel adjustment. The defects are found on these cars by cutting out the brake and applying it by loosening the triple valve union or cylinder cap. Using this method the men do not interfere with each other's tests. When it is necessary to change a triple valve or clean a brake cylinder on a foreign car, this is done and no bill rendered.

The workmen endeavor to give the trains to the transportation department in two hours. Usually, this is done, but if work is slack or there is no power or crews available, the cars are worked on until all of them will pass the retaining valve test.

Even this does not complete the work. On the arrival of the road engine and train crew, a retaining valve test of the entire train is again made under the supervision of the conductor. Each brakeman reports to the conductor the number of inefficient brakes he finds and the conductor figures the tonnage per good mountain brake and has it checked by the engineman. In arriving at this result, gross actual tons are used, and the brake conditions noted in the train book. If the maximum tonnage per good mountain brake is exceeded the conductor refuses to take the train.

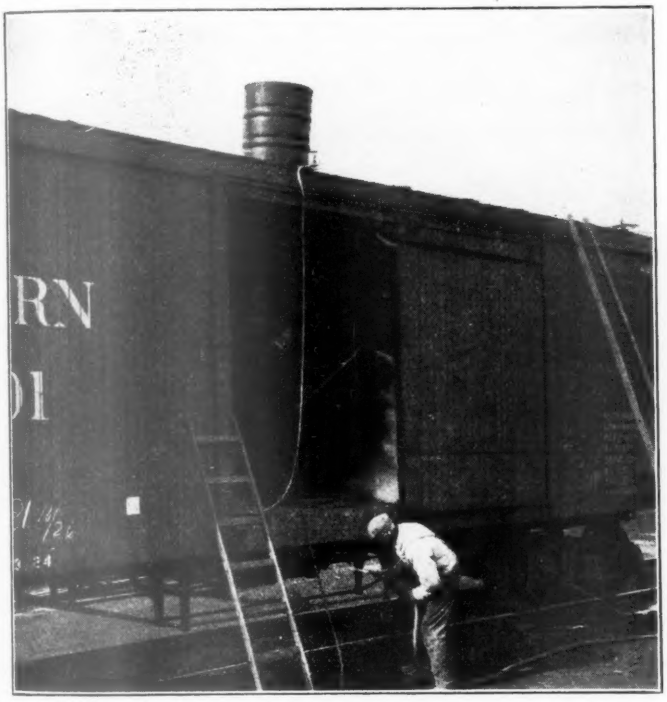
To the diligent efforts of all railroads to improve freight car brake conditions, we owe in large measures the success of power brake operation in descending mountain grades.

The Terminal Railroad Association of St. Louis exhibited at the St. Louis Union Station on April 12, a new locomotive built at its own shops for handling transfer traffic between the carriers connecting with the terminal. This locomotive in working order weighs 422,500 lb., and has a tractive force of 60,335 lb. It is one of twenty of its type added to the terminal equipment.

Preparing freight cars for products damaged by odors

ONE of the problems with which railroads are continually confronted is that of cleaning freight cars which have previously been used for shipping fertilizer, packing house offal, fresh hides, glue stock, guano etc., so that they may be used for carrying grain, butter, flour, etc., without any of these materials becoming contaminated.

The data which follows was based on a series of tests closely observed by railroad officers. Freight cars which had been used for different types of shipment were selected for the tests. For example, one freight car had been used for shipping bulk bone fertilizer. The walls and floor of this car were heavily coated, and the odor



Deodorizing a car by means of steam and a cleaning solution

remaining from the fertilizer was very offensive. The car itself was in good condition, the walls and floor being unbroken.

Another test was made on a car that had contained glue stock, guano, hides, etc. This car was not in as good condition as it might have been, the floor being splintered, and the side-walls missing in places. This was an old car, and during its years of service, had accumulated dirt and muck on the walls that consisted of almost everything that had ever been shipped in the car.

Still another test was made in cleaning a car in which shipments of fresh hides had been made. The walls and floor of this car were not heavily covered with refuse, but the odor remaining from hides was offensive. The walls and floor of this car were in good condition. After much experimental work a method was worked out which satisfactorily cleaned these cars.

Method of cleaning the cars

An empty drum for the storage of the cleaning solution, which is fed to the steam gun through a 3/16-in. welding hose, is placed on the top of car or any other suitable elevation. A valve connection is installed about 2 in. from the bottom of the drum, for controlling the flow of cleaning solution, which is fed by gravity.

A standard metal cleaner, at a strength of one-half pound per gallon, is used hot, being heated by turning hot steam into the drum through the steam hose. The procedure is as follows:

1—All loose refuse is removed by scraping and sweeping.

2—The car is thoroughly hosed out with cold water, and if the grain strip is poor it should be removed.

3—The cleaning solution is applied with a steam gun, over a period of from three to five hours, depending on the condition of the car, following every crack and crevice possible. This will require approximately 30 to 50 gallons of solution. Care should be taken to hold the gun over the crevice or opening a sufficient length of time to remove all refuse and saturate the wood.

4—The car should be thoroughly hosed out with cold water.

5—Chlorinated lime solution in the proportion of six ounces to the gallon should be made up in a 50-gal. barrel or drum. This should be thoroughly agitated and allowed to clear, containing no suspension of lime. The method of applying the chlorinated lime is the same as for applying the cleaning solution, care being taken to follow every crevice or opening. The under structure and flooring of the car should also be hosed off and sprayed with chlorinated lime solution. This solution liberates chlorine gas, and is very effective in clearing up bad odors. Ten to 20 gallons should be applied over a period of one to two hours, depending on the condition of the car. After the application of chorinated lime solution, the car should not be hosed down as this will destroy the effectiveness of the treatment.

6—The car should be allowed to dry out and if a slight odor still persists, 1½ lb. of chlorinated lime should be sprinkled on the floor of the car and brushed into the cracks or crevices allowing it to remain several hours before being swept aut.

The maximum cost of cleaning the dirtiest car of the four mentioned was as follows:

Labor, 10 hrs. at 40 cents per hr.	$4.00
Cleaning solution, 25 lb. at 13⅜ cents	3.34
Chlorinated lime, 9 lb. at 10⅔ cents	.96
Total	$8.30

Method of inspection

Three days after the cleaning was completed, the four cars were inspected. Three of the cars were passed as being suitable for any shipment, while the fourth car, which was used for fertilizer, still retained a trace of fertilizer odor. This car was passed as suitable for grain shipment. It was washed out again with the cleaning solution applied with the steam gun.

If there is the least trace of odor in a car it is impossible to ship such products as butter, flour, grain, etc. To check up the effect of the odor on such shipments, one pound of butter and half of a 25-lb. bag of flour were placed in the car that retained a slight trace of odor. The wrapper was removed from the butter and the bag of flour was left open. As a control a pound of butter from the same lot and a half of the bag of flour were kept in the storekeeper's office under a glass cover. After an exposure of 56 hr. in the car with the doors closed, there was no contamination of either the flour or the butter.

Interchange rules Nos. 30, 60 and 101

The Arbitration Committee has issued the following interpretations of Rules 30 and 60 to eliminate taking of joint evidence on trivial deviations in stencil markings, which are retroactive to cover unsettled cases under the rules and will be included in the first regular supplement to the current Rules of Interchange:

Rule 30. Q.—It is common practice to stencil new light weight marks a few inches directly above or below the line of previous marks to avoid delay in restenciling a car on account of wet paint over old marks.

It is also the practice to substitute 3-in. stenciling for 4-in. stenciling where the latter is the standard for the car, as well as 4-in. where 3-in. stenciling is standard. Do these deviations constitute wrong repairs?

A.—The new lightweight markings as to location and size should conform to the standard of the car. However, the conditions above described are not such as to justify the claim of wrong repairs.

Rule 60. Q.—Some roads are using 1¼-in. stencils, others 1½-in. for air brake marking, while the rule specifies 1-in. height. Should such marking be accepted as meeting requirements?

A.—The question of increasing the size of air brake stenciling is under consideration. It is suggested that a minimum of 1-in. and a maximum of 1½-in. be accepted as meeting present requirements.

Rule 101. Effective January 1, 1926, upon recommendation from the Committee on Brakes and Brake Equipment, the Arbitration Committee has modified Item 22A of this rule to read as follows:

Cylinder piston packing, Wabco, Flextite, Kendall or J. M. Type........

Attention is also directed to the following error in printing the 1925 Code of the Rules of Interchange, effective January 1, 1926:

Page 134, Rule 101, Item 194A, Note following—Service metal limit quoted in this note should read 35/16-in. instead of 3 5/16-in.

Flexible rivet bucker

By Joseph C. Coyle

WHEN repairing and rebuilding cars it is often necessary to drive rivets in positions where it is next to impossible to get the ordinary rivet bucker. The one shown in the illustration was originated for just such emergencies at the Denver shops of the Denver & Rio Grande Western. By the use of various amounts of blocking it may be used successfully in almost any position.

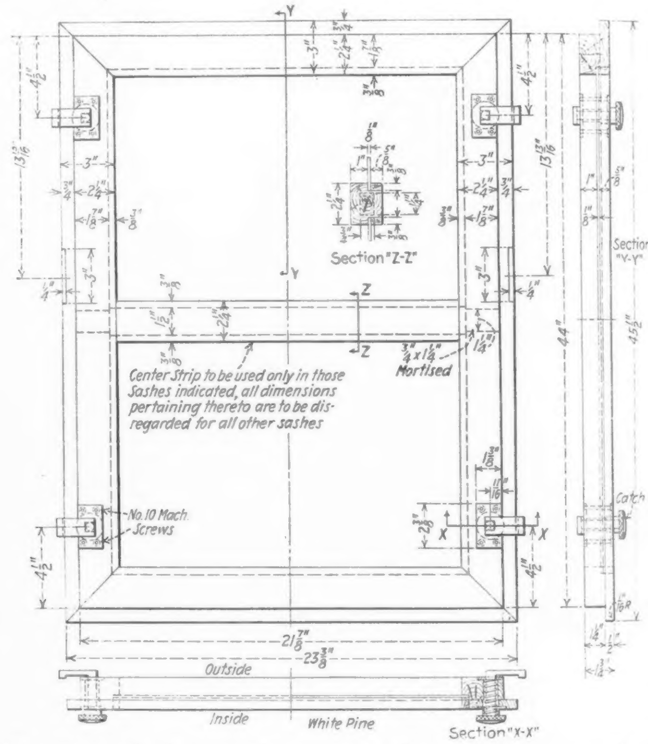
A flexible rivet bucker which may be used in close places

Two sections of 1½-in. round steel, 8 in. long are cut down about 4 in. from one end, with the acetylene torch. One of these sections is pointed at the opposite end to serve as a fulcrum for the bucker. A 4-in. section of 1½-in. by ¾-in. steel bar is loosely riveted to the center of the fulcrum and the back end of the bucker-bar. A second piece of the same size, 30 in. long is riveted to the end of fulcrum and the middle of bucker-bar, to act as a lever in the workman's hand. Owing to its flexibility this bucker may be inserted in very close places.

Emergency sash for passenger car windows

By E. A. Miller

WHEN the glass is broken in the door or window of a passenger car, it is generally left out until the train arrives at the end of its run, and when such accidents occur, it usually causes considerable inconvenience to the patrons of the railroad, especially in cold weather. An emergency sash, the detailed construction of which is shown in the drawing, has been designed and used for a considerable time by at least one road to meet just such emergencies. It can be made in various sizes to suit different sizes of doors or windows which are not the same on all classes of passenger equipment.

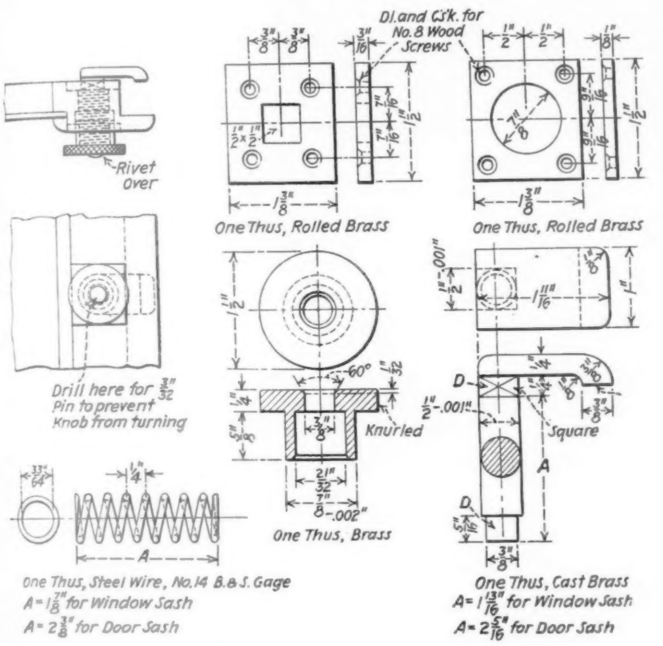


Drawing of the emergency sash for passenger car doors or windows

When a window is broken, the pieces of broken glass are removed and the emergency sash inserted in the frame of the permanent window from the inside of the car. The emergency window is made with a flange which fits up against the sash of the car window. It is held in place by means of four clamps, the detailed construction of which is shown in one of the drawings. The clamp is held by a coil spring. It has a square section *D* on the shaft and a knurled handle. A plate with the square hole is screwed on the outside of the emergency sash and the plate with the round hole on the inside. In applying the emergency sash the handle of the catch is pushed in until the square portion *D* of the clamp clears the square hole of the outside plate. The clamp is then turned until the arm clears the opening in the permanent

sash. When the emergency sash is in position, the clamp is again turned until *D* fits in the outside plate. The compression of the spring holds the emergency sash in place.

Emergency windows, such as that shown in drawing, are kept at frequent points along the line. In case the glass in a car window or door is broken, it is only necessary to wire ahead to the next stop to have an emergency window ready to place in the car. This arrangement tends to reduce the inconvenience and annoyance of the patrons



Detail drawing of the catch

of the railroad to a minimum and all that is necessary is that the car inspector, repairman, or whoever has charge of the windows, know the class of car in order to have the proper emergency sash ready when the train arrives. All sashes assigned to a given point are stenciled "return to ——" so that when the car reaches the terminal, a new glass is put in and the emergency sash is returned to its assigned location. If desired, an emergency sash can be carried in the toilet of each car.

Decisions of the Arbitration Committee

(*The Arbitration Committee of the A.R.A. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.*)

Defect card must be secured by handling line

Chicago, Burlington & Quincy car No. 102,193 was delivered empty to the Union Pacific by the Atchison, Topeka & Santa Fe at McPherson, Kan., on December 30, 1922, carded for movement home for repairs from Cleburne, Tex. The cards on the car, however, did not indicate the defects for which the car was returned to the owner and the car was not routed home over the Union Pacific. McPherson, Kan., is a junction point between the Union Pacific and the Santa Fe, but owing to the limited number of cars interchanged at this point, neither company maintains car inspectors there. The Union Pacific moved the car from McPherson, Kan., to Salina on December 30, 1922, and from Salina to Denver, Col., where it was delivered to the owner on January 7, 1923. The Union Pacific submitted an original copy of its record of inspection of this car at Salina, Kan., which showed that the car had six damaged sills when received at that point. When the car was delivered to the owner by the Union Pacific, the chief joint inspector issued a defect card against the handling line for which the owner rendered a bill for $334.68. When the handling line received the defect card, the car foreman of the Union Pacific at Salina asked the agent of that road at McPherson to request a defect card protection from the Santa Fe. The Union Pacific contended that the damage was in existence when the car was received from the Santa Fe and that as the Union Pacific moved the car over its rails to the owner, it should be protected by the Santa Fe against all claims of the car owner made under the interchange rules. The Santa Fe contended that the inspection of the car at Cleburne, Tex., showed that two metal center sills were badly bent and that the car was in need of general overhauling but was safe and therefore, as it had no record to show other than two metal center sills bent while the car was in its possession, the defect card protection required under Rule 43 was not due the U. P.

In rendering its decision the Arbitration Committee stated that "the interchange rules do not recognize the interchange of defective cars on record. If there was a combination of defective sills as per Rule 43 when the car was interchanged from the A. T. & S. F. to the Union Pacific, the latter should have protected itself by requiring a defect card or a statement as provided in the above rule, if it is claimed the damage occurred in fair service, at time of interchange. Therefore, the contention of the Union Pacific is not sustained."—*Case No.* 1350, *Union Pacific vs. Atchison, Topeka & Santa Fe.*

Substitution of steel tired for wrought steel wheels

The Canadian Pacific on October 22, 1923, removed a pair of wrought steel wheels from B. & L. E. car No. 14144 because of worn flanges and applied a pair of steel tired wheels, charging for 1½ in. of service metal in each wheel and allowing 1 in. service metal credit for each of the wheels removed. The car owner asked for a correction of debit to the value of the scrap metal in the steel tired wheels which request the Canadian-Pacific refused. The question involved in this case is, what is the proper method for handling the debits and credits wheen steel tired wheels are substituted for wrought steel wheels in cars stencilled to protect wrought steel wheels? The Canadian Pacific in defending its position, agreed that it had made wrong repairs and also that when steel tired wheels are removed and scrapped that the scrap value only should be allowed the car owner, but could not agree with the car owner that the charge for the wheels applied should be confined to the scrap value for the reason that, in no instance of wrong repairs performed by railway companies, is this principle invoked and the whole spirit of the A.R.A. rules is contrary to such a principle, according to Rule 88 and its interpretations. The car owner stated that it did not consider steel tired wheels safe for service because of the danger of a tire breaking or becoming loose from heating caused by the prolonged application of brakes on long grades or by brakes sticking. As a consequence the use of such wheels was discontinued many years ago. The steel-tired wheels applied by the Canadian Pacific to the

car in question were accordingly scrapped when removed. As a result, the car owner had on its hands a pair of steel-tired wheels which it could not use on its own equipment and which, it considered, could not be applied to foreign cars unless they were stencilled for such wheels, none of which had ever come within its knowledge. As a result of this situation, the car owner claimed that it should not be made responsible for this loss as the Canadian Pacific was not forced into the situation through not having wrought steel wheels in stock. It was possible for the repairing line to turn and re-apply the wheels removed.

The Arbitration Committee rendered the following decision: "The charges and credits account of wrought-steel wheels are covered in one billing transaction, in accordance with Rule 98, as an exception to the general rules covering settlement for other wrong repairs. A car owner should not be penalized for the improper substitution of steel-tired wheels by other roads. In view of the circumstances in this case, the steel-tired wheels should be billed against the car owner at scrap price." *Case No.* 1352, *Canadian Pacific vs. Bessemer & Lake Erie.*

Time limit for securing joint evidence

On August 12, 1923, Macon, Dublin & Savannah flat car No. 105 was received home from the Central of Georgia and was placed in the shop December 8, 1923, for general repairs. The following wrong repairs were discovered:

2	Center sill spices, 5 ft. by 8 ft. by 10 ft.	B
2	Draft timbers, 5 ft. by 8 ft. by 5 ft.	B
1	Carrier iron 1 in. by 3 in. by 24 in.	B
1	End sill 8 ft. by 8 ft. by 9 ft.	B
1	Dead block framed wrong without a groove for the striking plate	B
1	Striking plate, 1 in. by 8 in. by 28 in.	B
2	Center sills, 5 ft. by 8¼ ft. by 10 ft.	B
2	Draft timbers, 5 ft. by 9 ft. by 5 ft. 4 in.	B
1	Carrier iron 1 in. by 4 in. by 26 in.	B
1	End sill, 8 ft. by 8 ft. 3 in. by 9 ft.	B
1	Dead block framed for striking plate grooved	B
1	Striking plate, 1 in. by 4 in. by 28 in.	B

Joint evidence was secured by a representative of the car owner and the chief car inspector of the Central of Georgia. The joint evidence card together with the Ft. Worth & Denver City billing repair cards which showed that these wrong repairs were made by the F. W. & D. C., were mailed to the last mentioned road with a request to furnish an A.R.A. defect card to cover the wrong repairs made by that company. The F. W. & D. C. returned the joint evidence card and its billing repair cards, referring to Rule 12, paragraph 5, which states that joint evidence must be made within 90 days from first receiving the car home, and requested the M. D. & S. to withdraw its claims for a defect card. The car owner admitted that it had violated Rule 12 by not securing the joint evidence in the required 90 days and gave as a reason that owing to heavy business during the summer and fall months of 1923, the car was placed on the storage track to await its turn in the shop. The car owner stated further that it was not customary for car inspectors on interchange tracks to know the standard sizes of sills and such parts of cars and therefore, the wrong repairs were not discovered until the car reached the shop. Furthermore, the F. W. & D. C. violated Rule 87 by not attaching its defect card to cover the wrong repairs made, also violated Rule 113 by not using the material standard to the car, and it did not comply with Rule 16.

In rendering its decision, the Arbitration Committee stated that "The Macon, Dublin & Savannah failed to obtain the joint evidence within 90 days after first receipt of the car home, as per Rule 12, fifth paragraph. Therefore, the contention of the Ft. Worth & Denver City is sustained." *Case No.* 1351, *Macon, Dublin & Savannah vs. Fort Worth & Denver City.*

Another case under Rule 32

Chicago, Milwaukee & St. Paul loaded wooden box car No. 63200, while in switching service on the Chicago & Alton on June 24, 1923, broke in two and buckled out of line. The car was not derailed, cornered, or side-swiped, nor were any of the other cars handled at that time. The handling line refused to assume the responsibility for the defects under Rule 32 and instead reported the car to the owner under Rule 120. The owner claimed that under ordinary switching conditions the car could not have sustained the damages listed on the inspection certificate and, therefore, refused to accept responsibility. The handling line stated that the car while being shifted developed defects caused by its advanced age and general dilapidated condition which rendered it unfit for further movement and that the contents were transferred to another car. The handling line stated further that the conductor in charge of switching noticed the apparent weak and worn condition of the car and took precaution in handling not to damage it further. Furthermore the car was dropped in on the proper classification track at a speed of one mile an hour without rider protection which the handling line stated was not required in the Glenn yard which is a flat yard. The car owner contended that the car did not have the benefit of rider protection.

In rendering its decision the Arbitration Committee stated that, "The car was handled without rider protection and therefore, the handling line is responsible according to Rule 32, Section D, Item 4."—*Case No.* 1355, *Chicago & Alton vs. Chicago, Milwaukee & St. Paul.*

New wheels applied on authority of defect card

On November 19, 1923, when the Charleston & Western Carolina delivered Interstate car No. 5163 to its connection at Spartanburg, S. C., with two pairs of slid flat, cast-iron wheels a defect card was issued and attached to the car to cover 2½-in. defects. The car owner removed the two pairs of slid flat wheels and applied new cast iron wheels and rendered a bill against the Charleston & Western Carolina for the difference in value of scrap cast iron wheels and new cast iron wheels, brass and the labor charge applicable for making the repairs. The C. & W. C. claimed that the charge should have been confined to the difference in price between scrap and second-hand wheels, as the application of new cast iron wheels was a betterment for which the car owner was responsible. The handling line further contended that its exception was in accordance with Rules 98 and 101 and the charge for wheels should be as per Item 192-B, Rule 101, $14.56 instead of $47.12. The owner contended that the A. R. A. Rules in effect at the time the defect card was issued and at the time the wheels were applied, permitted the charge as made and if the C. & W. C. had wanted to confine the cost of making repairs to the difference in the price of scrap and second-hand wheels, it should have made the repairs and taken advantage of the rules which permit the replacing of slid flat wheels with serviceable second-hand wheels. It further contended that the claim of the C. & W. C. was inconsistent in so far as it referred to cast iron wheels as a betterment, as the wheel and axle statement showed that the wheels removed were cast August 15, 1923, and the wheels applied were cast September 6, 1923.

The Arbitration Committee rendered the following decision: "The owner's contention is sustained. The date of issuance of defect card governs the responsibility and 1922 Rules of Interchange are applicable. Owners are justified in charging for new wheels applied due to wheels removed on account of delivering line defects." *Case No.* 1354, *C. & W. C. vs. The Interstate Railroad.*

Preventing grinding wheel accidents

THE following recommendations are from the Safety Code approved by the American Engineering Standards Committee. They refer to precautions that should be taken to prevent accidents in the operation of grinding equipment.

Grinding machine requirements—Grinding machines should be sufficiently heavy and rigid to prevent vibration, and should be securely mounted on substantial floors, benches, foundations, or other structures.

Direction of spindle thread—The ends of spindles shall be so threaded that the nuts on both ends will tend to tighten as the spindles revolve. Care should be taken in setting up machines to see that the spindles are arranged to revolve in the proper direction, or else the nuts on the ends will loosen. To remove the nuts, they should both be turned in the direction in which the spindle revolves when the wheel is in operation.

Length of spindle thread—The length of the spindle and the distance that the thread extends from the end shall be such as to allow the entire length of the nut to bear on the thread so as to exert its full pressure on all thicknesses of wheels which may be used.

Spindle fit—Grinding wheels should fit freely on the spindles; they should not be forced on, nor should they be too loose.

Protection hoods—Hoods should be used on every operation where the nature of the work will permit, and should always be used with wheels that are not provided with protection flanges, chucks or bands.

Replacing hood—After mounting a new wheel, care should be taken to see that the hood is properly replaced.

Work-rest adjustment—The work-rest should be kept adjusted close to the wheel, with a maximum distance of 1/8-in., to prevent the work from being caught between the wheel and rest, and should be securely clamped after each adjustment.

Cup, cylinder and ring wheels—Cups, cylinders and sectional ring wheels should be either protected with hoods, enclosed in protection chucks, or surrounded with protection bands. Not more than one-quarter of the height of such grinding wheels shall protrude beyond the provided protection. Where the thickness of the rim of such wheels is less than 2 in., the maximum distance that the wheel may protrude beyond the provided protection shall not exceed 1 in. If the thickness of the rim is 2 in. or more, the wheel may protrude 2 in. beyond the protection, but shall not exceed this amount.

Inspection of wheels—Immediately upon receipt, all wheels should be closely inspected to make sure that they have not been injured in transit or otherwise. As an added precaution, wheels should be tapped gently with a light implement, such as the handle of a screwdriver. If they sound cracked, they should not be used. Wheels must be dry and free from sawdust when being tested. Before being mounted, all wheels should again be closely inspected to make sure that they have not been injured in transit, storage or otherwise.

Inspection after breakage—Whenever a wheel breaks, a careful inspection shall be made to make sure that the hood has not been damaged, nor the flanges bent or sprung out of true or out of balance. The spindle and nuts shall also be carefully inspected.

Surface condition—All surfaces of wheels, washers and flanges in contact with each other should be free from foreign material.

Bushing—The soft metal bushing shall not extend beyond the sides of the wheel.

Washers or blotters—Washers or flange facings of compressible material shall be fitted between the wheel and its flanges. If blotting paper is used, it should not be thicker than 0.25 in. If rubber or leather is used, it should not be thicker than 1/8 in. If flanges with babbitt or lead facing are used, the thickness of the babbitt or lead should not exceed 1/8 in. The diameter of the washers should not be smaller than the diameter of the flanges of the grinding wheels.

Tightening of nut—When tightening spindle end nuts, care should be taken to tighten them only enough to hold the wheel firmly; otherwise, the clamping strain is likely to damage the wheel or associated parts.

Responsibility—Competent men should be assigned to the mounting, care and inspection of grinding wheels and machines.

Starting new wheels—All new wheels shall be run at full operating speed for at least one minute before applying the work, during which time the operator shall stand at one side.

Appying work—Work should not be forced against a cold wheel, but applied gradually so as to give the wheel an opportunity to warm and thereby minimize the chance of breakage. This applies to starting work in the morning in cold rooms and to new wheels which have been stored in a cold place.

Dresser guards—Wheel dressers, except the diamond type, shall be equipped with guards over the tops of the cutters to protect the operator from flying pieces of broken cutters or wheel particles.

Grinding room—The space about the machine should

be kept light, dry and as free as possible from obstructions.

Lubrication—Care should be exercised so that the spindle will not become sufficiently heated to damage the wheel.

Flanges—All wheels except those that are mounted in chucks shall always be run with flanges.

Recess in flanges—Each flange, whether straight or tapered, shall be recessed at the center at least 1/16 in. on the side next to the wheel.

Flange fit—The inner flange, shall be keyed, screwed, shrunk, or pressed on the spindle, and the bearing surface shall run true at right angles with the spindle. The bore in the outer flange should be not more than .002 in. larger than the spindle.

Test for balance—Wheels should occasionally be tested for balance and rebalanced if necessary. Wheels worn out of round should be trued by a competent man. Wheels out of balance through wear, which cannot be balanced by truing or dressing, should be removed from the machine.

Truing—Truing is best accomplished by the use of a diamond rather than with a wheel dresser, the function of which is dressing only. Truing is not necessarily a sharpening operation, but is what its name implies. Dressing rarely trues a wheel.

Wet grinding wheels—Wheels used in wet grinding should not be allowed to stand partly immersed in the water. The water-soaked portion may throw the wheel dangerously out of balance. All wet tool grinders that are not so designed as to provide a constant supply of fresh water should be thoroughly drained at the end of each day's work, and a fresh supply provided just before starting.

Side grinding—Grinding on the flat sides of straight wheels is often hazardous, and should not be allowed on operations where the sides of the wheel are appreciably worn thereby or where any considerable or sudden pressure is brought to bear against the sides.

Boiler blow-off truck

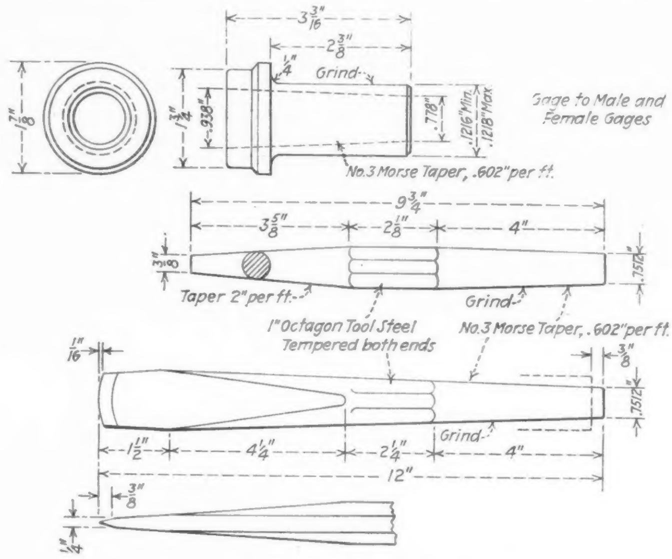
Anyone who has ever had anything to do with work around an enginehouse knows what a disagreeable job washing boilers may prove to be at times. Any device

Truck equipped with portable blow-off connections

which will render this work less unpleasant or save time and labor is of more than usual interest. The accompanying illustration shows the general arrangement of a truck used at the Glennwood, Pa., engine terminal of the Baltimore & Ohio which saves much work and eliminates the handling of hose. The outfit is simple to construct, consisting principally of a four-wheeled platform truck with a strap iron frame-work, supporting several sections of suitable size pipe connected by flexible ball-joints. The several sections are arranged in such a manner that they may conveniently be used to make the connection from the boiler blow-off cock to the blow-off line of a boiler washing and filling system. On the platform of the truck is a tool box containing all the necessary tools for the job, and a muffler to be used when blowing off steam from the boiler.

Taper shank for air hammer tools

The taper shank for air hammer tools is being accepted in many shops as standard equipment and is also manufactured by a number of pneumatic tool companies. It is said to be a considerable improvement over the round shank which tends to break due to the repeated stresses set up by the air hammer plunger. The taper



Taper shank tools for air hammers

shank is driven from the taper seat or guiding shell which permits greater freedom of action of the tool in respect to alinement with the air hammer body. The round shank tool does not allow for such action but is held in rigid alinement.

Another point claimed in favor of the use of a taper shank for air hammer tools is that it is not necessary to finish the shank which eliminates machine work. The shank can be formed in a die in the blacksmith shop to the required taper. After the taper shank has been drawn but, it is ground off so that it will extend through the guiding shell the required length of 3/8 in.

A New Record for heavy locomotive repairs for the lines west of Pittsburgh was attained recently at the Columbus, Ohio, shops of the Pennsylvania Railroad when 59 class repairs and 20 heavy running repairs were turned out during the month of March. The work, accomplished with the help of skilled workers from other points in the western region, under the direction of T. W. Lowe, general foreman, locomotive department, included three Class 1 repairs; 13 Class 2 repairs; 33 Class 3 repairs; 10 Class 4 repairs, and repairs to 77 tenders.

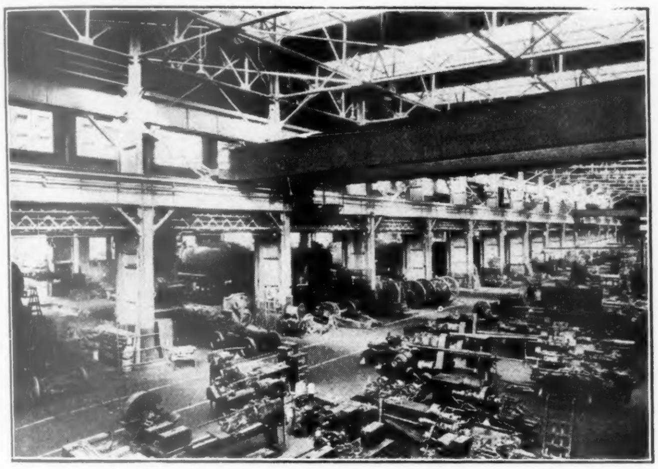
Repairing locomotives at Pennsylvania Railroad Juniata shop*

Utilization of semi-finished parts and micrometers, dimension forms—Other machine shop methods

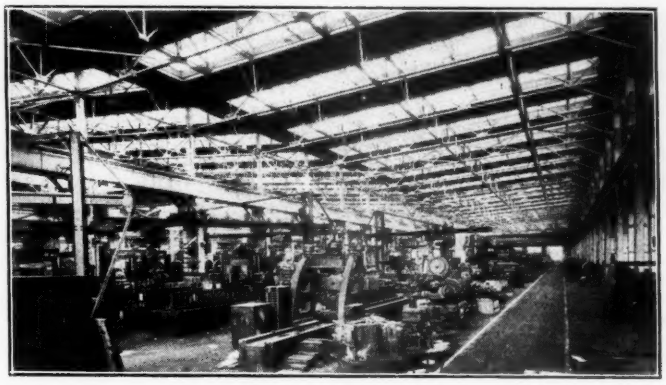
Part II

IN order properly to understand many of the machine operations in the two machine bays and the plan followed by the inspectors when deciding on the repairs required and the system of marking on the special dimension blanks the sizes to which the new parts should be machined, a general knowledge of the Pennsylvania Locomotive Maintenance Instructions is necessary.

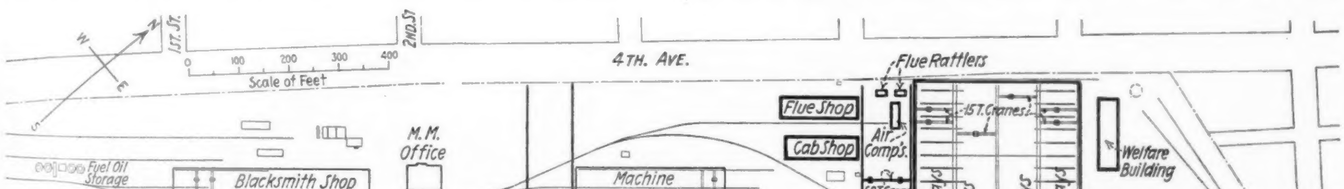
These instructions have been issued for the guidance of the shops when manufacturing parts for new or repaired locomotives, when fitting new parts to the old parts, and in determining allowable limits of wear before repairs or replacements are considered necessary. Practically all the measurements mentioned on these instructions are in thousandths of an inch, which makes it comparatively easy to take all measurements with micrometer calipers and record them readily on dimension blanks. Owing to the fact that the limits of wear on the various wearing surfaces, as well as the tolerances permitted on the part of the workmen when fitting new parts, are specified by the maintenance instructions, the effect of variations in individual judgment of the inspectors or workmen is eliminated.



The machines in the foreground are used in the brass and bolt gang—To the left is a general view of erecting shop No. 2



General view of the west machine bay showing the machines for repairing driving boxes in the foreground—Note the platforms loaded with material brought from the cleaning vats by electric trucks



General plan of the Juniata shops—The new facilities are shown in heavy lines

This may be illustrated by the case of a journal of a driving axle. The Locomotive Maintenance Instructions specify that when the journal of a driving axle is less

*The shop layout, machine tools and shop equipment, the scheduling system, material delivery and inspection methods were described in Part I.

than .032 in. out-of-round, has less than .032 in. taper and is not cut or in otherwise poor condition, it will be satisfactory to put the journal back into service without making repairs. When the out-of-round, or the taper exceeds these limits, the journal must be turned and refinished. The instructions also specify that after re-turning, the limit of out-of-round or taper shall not exceed .005 in.

When the axle is ready for inspection, the inspector measures the journal with micrometer calipers, first ascertaining the largest then the smallest diameter, the difference between the two readings determining whether or not the journal will go back into service without repairs, or whether it shall be sent to the journal lathe for re-turning. Assuming that the journal comes within the limits and is smooth, under which condition no turning is required, the size of the largest diameter is then marked on the dimension chart blank for frame, journal, hub and box sizes shown in the illustration. In the event of not meeting the maintenance requirements, the journal is marked for re-turning, after which it is again inspected and if the dimensions are according to requirements, the largest size is measured and marked on the dimension blank.

From the data given on these dimension blanks, the diameter to which the driving box brass is to be bored is determined; that is, the bore of the driving box brass should be .020 in. larger than the journal. However, a limit of .005 in., plus or minus, is allowed the workman when boring the brass. Therefore, he must bore between


JUNIATA SHOPS

Preliminary Inspection Report - Boiler Work

Loco. No..........Class.........Divn.................Class Repra........Date Rec'd........

GRATES:
Drop
Shaking
Dead
Grate Operating Rigging
ASH PAN:
Wing Sheets R. L.
Front Head
Back Head
Front Hopper
Back Hopper
Operating Rigging
FLUES:
Superhtr. Renew Chip & Weld
Small " " "
Flue Sheet, Front
Flue Sheet, Rear
Flue Sheet, Caulking Edge
Fire Box Side Sheet R. L.
Door Sheet
Crown Sheet in Fire Box
Crown Sheet in Boiler
Outside Sheets Below Jackt. R. L.
ARCH TUBES:
#1 Front #1 Back
#2 Front #2 Back
#3 Front #3 Back
#4 Front #4 Back
BOILER TEE IRONS:
#1
#2
#3
#4

Lift Pipe
Front End Arrgt.
Boiler Built
BOILER WORK DUE:
Removal of Flues
Yes.........Date Due for
No..........Removal.............
S.B.Examination
Yes.........Date Due for
No..........Examination
All Jackt. & Lag. Removed
Yes.........Date Due for
No..........Removal.............
Removal Staybolt Caps
Yes.........Date Due for
No..........Removal
Hydrostatic Test
Yes.........Date Due for
No..........Test
Application Hollow Staybolts
Back of Grate Bearers
Yes.........Date Due for
No..........Appl.................
Boiler Equip. with the two outside rows Expan. Stays in Crown Sheet
Yes.............................
No..............................
Front Flue Sheet Braces
Back Head Braces
Back Head Sheet
Throat Sheet

Remarks:

Date Inspected Inspector

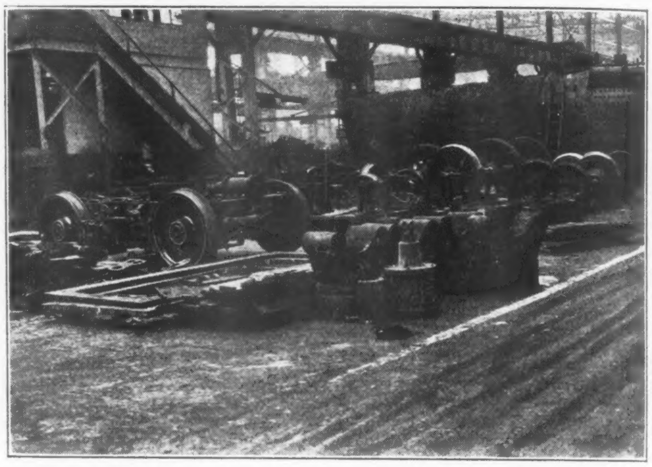
When the boiler inspector makes an examination of a locomotive coming into the shop he fills out this report

.015 and .025 in. larger than the journal to meet the requirements.

While the driving axle has been cited as a specific case, similar instructions covering practically all of the important locomotive parts are available. These instructions are posted about the shops and are frequently referred to by the inspectors and the workmen. In the event of disputes, the micrometer measurements and the instructions will show who is at fault.

Repairing parts in the machine bay

The practice of standardizing the repairs of locomotive parts makes it possible for many of the parts to lose their identity when removed by the stripping gang. Thus, the driving boxes, main and side rods if the brasses must be renewed, pistons, crossheads, valve and link motion parts, foundation brake and spring rigging, ash pans and engine and trailer trucks seldom are put back on the same locomotives from which they were removed. These parts are repaired and brought back to standard dimensions, except where variable conditions are met due to fits to other parts, after which they are considered as stock material. Say, for instance, a set of Ils driving box sizes are needed for the erecting shop to lay out shoes. These stock boxes have been repaired and await only the journal and hub sizes for final boring and facing of the brasses and hub liners. Ten boxes are selected, the engine number and



Engine and trailer trucks are repaired along the west side of the office building

location are stenciled on them and the sizes furnished the erecting shop on a form. After the journal and hub sizes are determined the boxes can then be bored and faced to fit. This practice speeds up the repair operations and permits a considerable part of the machine shop repair work to be done on a small scale production basis. Parts like brake rigging lose their identity, are made standard and sent to the locomotive in complete sets.

After removing the main rods, they are cleaned and forwarded to the rod gang, placed on trestles, the brasses removed and the rods examined for possible defects. The openings in the front and rear jaws are measured with micrometers. If a jaw opening varies from parallel more than the maximum allowed, the rod is sent to a slotter for truing. Also if the side faces of the jaws are worn out of parallel, they are ground on a vertical surface grinder while held on a magnetic chuck. As a rule, the blocks, wedges and, at times, the front end brasses are placed in the rods at the time of grinding in order to finish these parts flush with the sides of the rods. This practice eliminates much of the work of fitting the wedges and brasses and also gives the sides of the rods a finished bearing surface.

After the ends are found to be within the limits specified by the maintenance instructions, the width of the jaw opening and also the thickness of the rod at the rear end are measured with micrometers and the sizes marked on a blank from which the front and rear brasses are milled to the required rod fits.

Machining rear main rod brasses

The scale on the phosphor bronze rod brass castings rapidly wears the cutting tools and this is expensive in the case of milling cutters. The back end main rod brasses are, therefore, rough machined on planers, 16

pairs at one set-up. This work is done in one of the production machine shops at Juniata or the Altoona machine shops. The two abutting surfaces are smoothly finished and the surfaces that bear on the rod are rough planed to allow about 3/16 in. on all surfaces for the final fitting in the rod. These semi-finished brasses are then placed in stock.

When a new pair of rod brasses is to be placed in a rod, the final finishing is done in the west machine shop bay of the new shop on a knee type plain milling machine. The semi-finished brasses are held in an eight-point indexing fixture shown in one of the illustrations. The two halves of the brass are butted together and clamped

A section of the valve and link motion repair gang

by the handle shown at the top of the fixture. The width between the flanges on one side of the brass is milled to the dimension called for on the rod dimension blank. During the milling operation this dimension is frequently checked with inside micrometers to insure that the distance will be the same as the rod width. The micrometer dial on the elevating screw of the machine is set to zero after the milling of the first lower flange has been completed and a memorandum is made of the reading at the completion of the first upper flange. These readings are used when milling the flanges on the other faces of the brass.

The rod bearing surface between the flanges is then milled, after which the fixture is indexed one half turn and the opposite flange and the rod bearing surface are milled. The table elevation for the flanges is governed by the previous dial settings. The width between the two rod bearing surfaces is carefully measured with outside micrometer calipers to insure that this distance will be the same as called for on the dimension blank. The fixture is then indexed one quarter turn, after which the front flanges and the bearing surface between them are milled. The same operation is repeated for the opposite end. The brasses are then stamped to designate the rod to which they belong and also with the workman's initials.

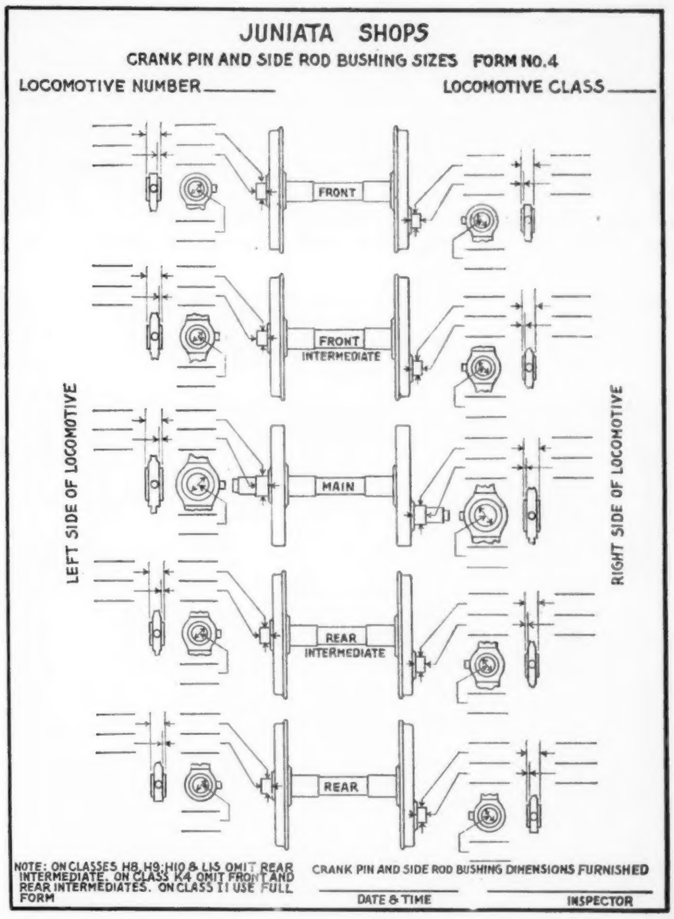
One of the novel features of this practice of fitting rod brasses is the fact that the man who mills and measures the brasses seldom sees the rod into which they are to be placed. Old brasses within certain limits are reclaimed by sweating liners on them and machining to fit in much the same way.

Correct fits require accuracy of measurement on the part of one man and accurate machine work on the part of another. It has been found that the men soon become proficient in these methods, so that they can make fits which require no filing other than to remove the burrs.

Machining front main rod brasses

The front main rod brasses are semi-finished in the manufacturing shops in the same manner as the rear brasses, with an allowance of about 1/8 in. for final finishing. The top and bottom surfaces of the brasses that fit the rod jaws are milled according to the dimensions called for on the dimension blanks. The general plan of milling is similar to that described in connection with rear brasses. The sides of the front brasses are at times ground on the surface grinder when truing the sides of the rods. Old front end brasses within certain limits are reclaimed the same as are the back end brasses.

After the milling of the brasses has been completed and such minor work as wedge repairs, re-reaming taper holes, etc., is finished the brasses, wedges and necessary parts are placed in the rods. They are then stored until the sizes for boring the brasses are available. Owing to the interchangeability of the rods on locomotives of the same class, it is not necessary to replace the rods on the same locomotive from which they were removed. A considerable number are thus always on hand in the shop ready for the final boring for the crank and crosshead pins. The



This form is filled out by the driving box, rod and wheel inspector

locomotive number is stencilled on the rods after the pin fits have been bored.

Boring crank and crosshead pin sizes

The sizes for the boring of crank and crosshead pins are taken from the dimension blanks shown in one of the illustrations. When boring and facing the rear rod brasses, they are held in a special fixture on a 36-in. vertical side boring mill. The tightening of the fixture automatically centers the brass on the machine table. It

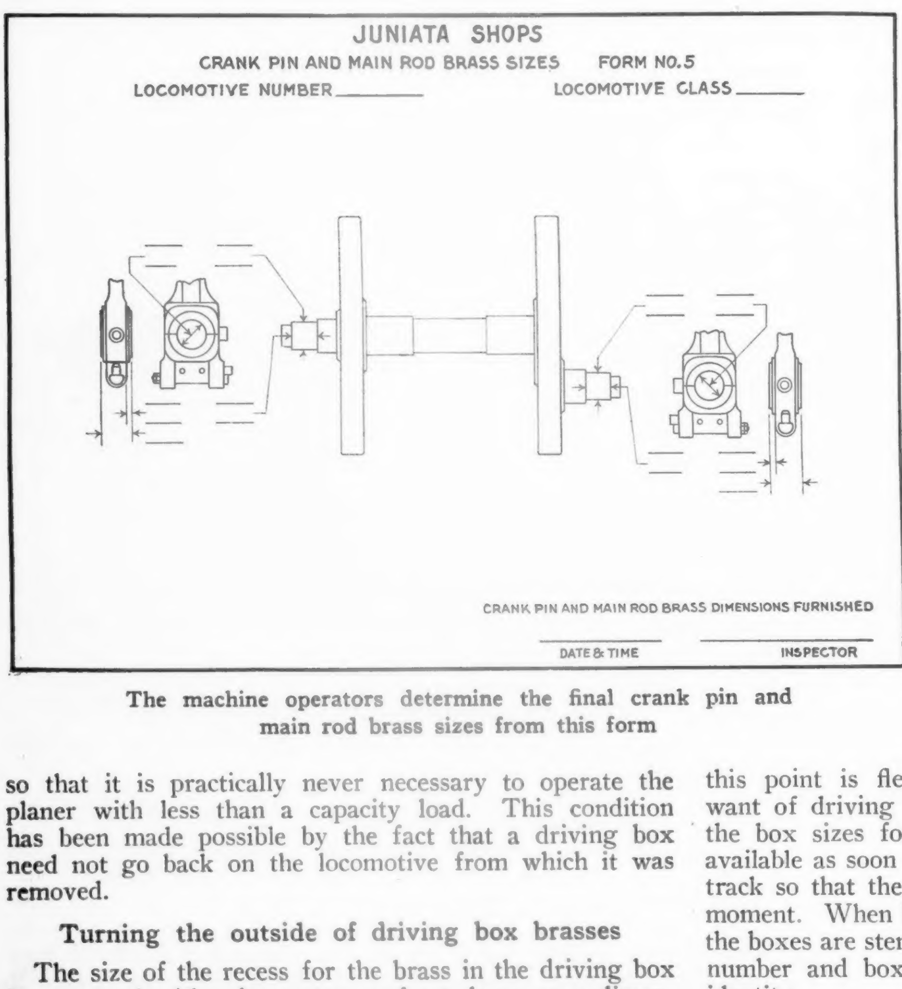
is then bored to micrometer sizes which are .010 in. larger than the crank pins as called for on the dimension blank. The top side is faced while in the fixture and, after a second chucking, the bottom side is faced so that the distance between the faces is the same as called for on the dimension blank.

Repairing driving boxes

After removing the driving boxes, they are cleaned and forwarded to the driving box section located in the west machine bay. The machines and work are arranged in the box gang so that the boxes always move forward without back traveling. The cellars are removed and the brass and babbitt side bearings are examined and, if not satisfactory, the brasses are removed in a 70-ton motor-driven hydraulic press.

The shoe and wedge faces are examined and, if found worn or if the two faces are not in proper alinement, the boxes are sent to the planer for refacing. The boxes are bolted in a double row against an upright center piece, the sides of which are parallel to the center line of the table of a 48-in. by 16-ft. planer, the lower shoe or wedge faces of the box resting on a parallel strip. The general practice is to load the planer with as many boxes as can be selected having approximately the same distances between shoe and wedge faces, in order to machine the greatest possible number at one time. After finishing one face, the boxes are reversed and the opposite surface refinished.

On the average about 150 driving boxes are always undergoing repairs in the box gang. Thus, it is possible to select boxes having approximately the same amount of wear below the standard dimensions. The odd sizes are held for later matching with boxes of similar sizes, so that it is practically never necessary to operate the planer with less than a capacity load. This condition has been made possible by the fact that a driving box need not go back on the locomotive from which it was removed.

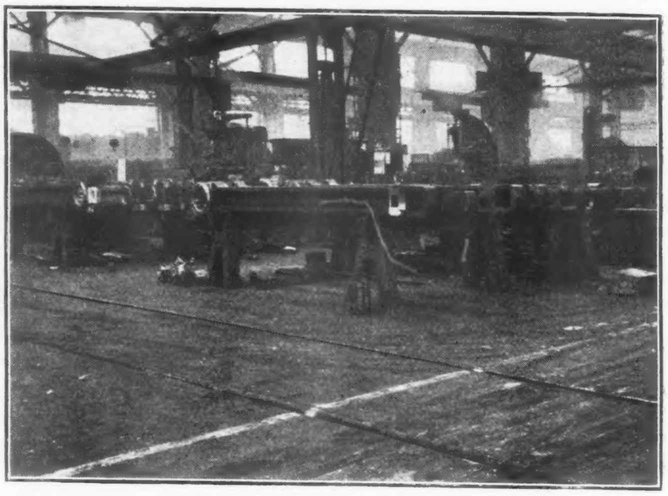


The machine operators determine the final crank pin and main rod brass sizes from this form

Turning the outside of driving box brasses

The size of the recess for the brass in the driving box is measured with micrometers and set down on a dimension blank. The size for turning the outside of the brass is taken from this data. The brasses are turned, two at a time on a 30-in. by 12-ft. lathe, shown in one of the illustrations, which is equipped with two tool posts on the carriage, one for each brass.

The two brasses are held on the arbor as shown. This has one central fixed flange common to the two brasses and two movable flanges, each adjustable by a nut in order to accommodate varying lengths of brasses. The brasses are held between the flanges by cup-pointed set screws located in the flanges, the points of which bear against the ends of the brasses.



The driving rods are repaired in the north end of the machine bays

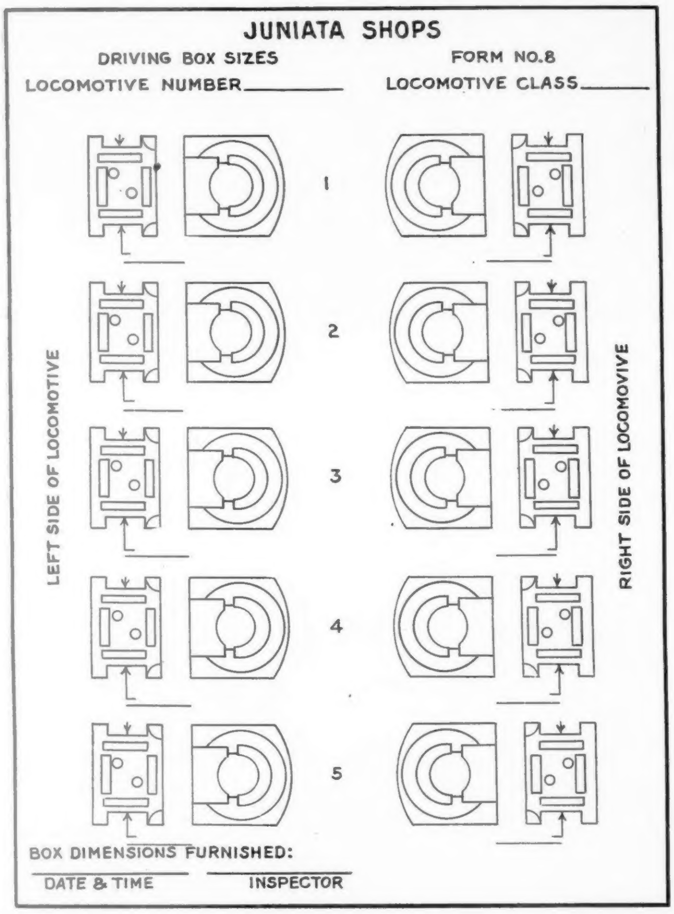
When loading the arbor, a block or filler piece is placed on the arbor, which also rests against the inside crown of the brass, locating it to the correct radius. The two brasses are rough turned and the tools are then set to the correct size and the finish cut taken. The advantages of the double arbor are the better running balance of the lathe and the saving of time.

The brasses are afterwards slotted for end size and then pressed into the driving boxes. The babbitt side bearings are then removed by placing the box in melted babbitt at the babbitt furnace, after which the new babbitt is applied. The box is then repaired at the cellar fit and a previously repaired cellar is then put in place. After these operations the boxes are stored awaiting the sizes for the final boring and facing. Owing to the large number of locomotives in the shop, the repair operation on the driving boxes up to this point is flexible. There is never any delay for want of driving boxes ready for boring and facing and the box sizes for laying off the shoes and wedges are available as soon as the locomotive is placed on the repair track so that the scheduling of this item is not of much moment. When box sizes are furnished the erecting shop, the boxes are stencilled with the locomotive number, wheel number and box location after which the box assumes identity.

Boring and facing driving boxes

The sizes for the boring of the driving boxes and the facing of the babbitt hub plates are set down on dimension blanks, as shown in one of the illustrations by the inspectors when inspecting the driving wheels. The blank is then given to the driving box gang foreman who picks out the set of boxes for that locomotive, having stencilled on them the locomotive number and journal location whose pedestal fit sizes he has furnished the erecting shop previously and the boxes are then bored and faced to conform to the journal chart.

The boxes are bored and faced on a special driving box boring mill, which is equipped with a special heavy two-jaw universal chuck amply strong to hold the box under the heaviest cut. The box is held on the two shoe and wedge faces by the chuck jaws which, when tightened,

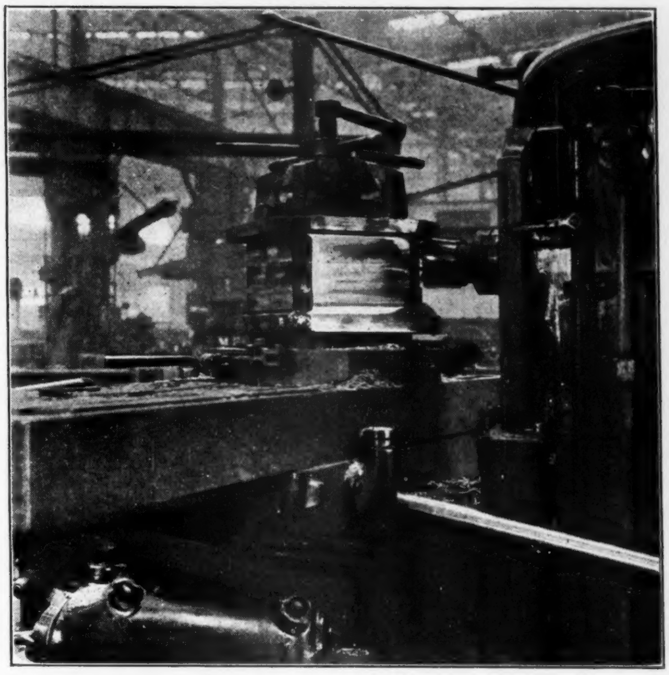


This form is filled in and given to the planer operator in the driving box gang

bring the vertical center line of the box into line with the turning center of the machine. The chuck with the box in place is adjustable in relation to the machine table in line with the vertical center line of the box.

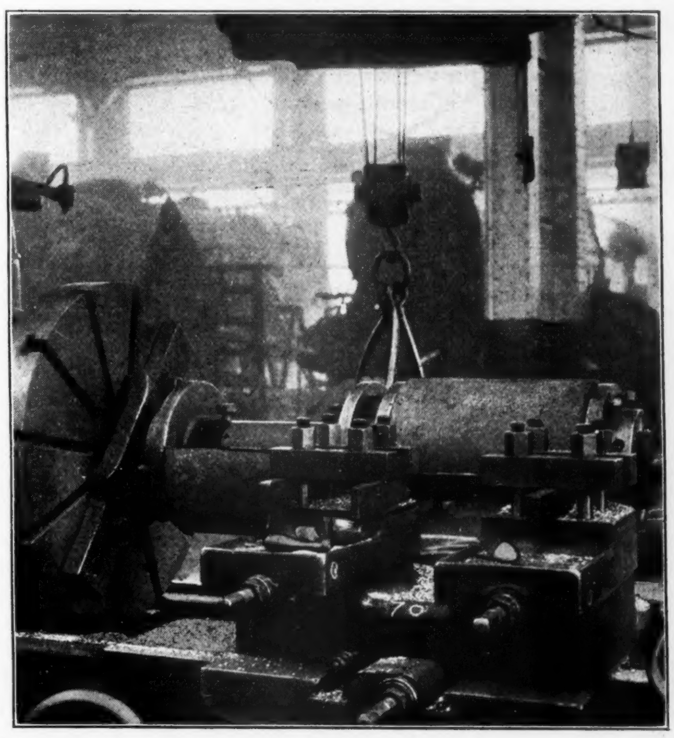
The roughing and finishing boring tools are held in a large adjustable boring bar similar in design to that used for car wheel boring. The hub liner is turned with a tool held in the side head. When starting the work, the driving box with the cellar in place is lifted with a jib crane into the mill and tightened in the chuck, which is adjusted by a single screw to bore the desired amount from the crown of the brass. The height of the side cutting tool is set from the lower surface of the upper flange of the box. The dimension for this setting is taken from the wheel dimension blank. The cutting tools in the boring bar are set for the roughing out by the micrometer dial on the boring bar.

The brass and the walls of the cellar are then rough bored and at the same time the box is faced to size. The boring bar is then raised and the chuck shifted to bore 1/32 in. higher in the crown in order that the cellar will



With the use of this jig the four faces and the corners of a main rod brass can be milled with one set-up

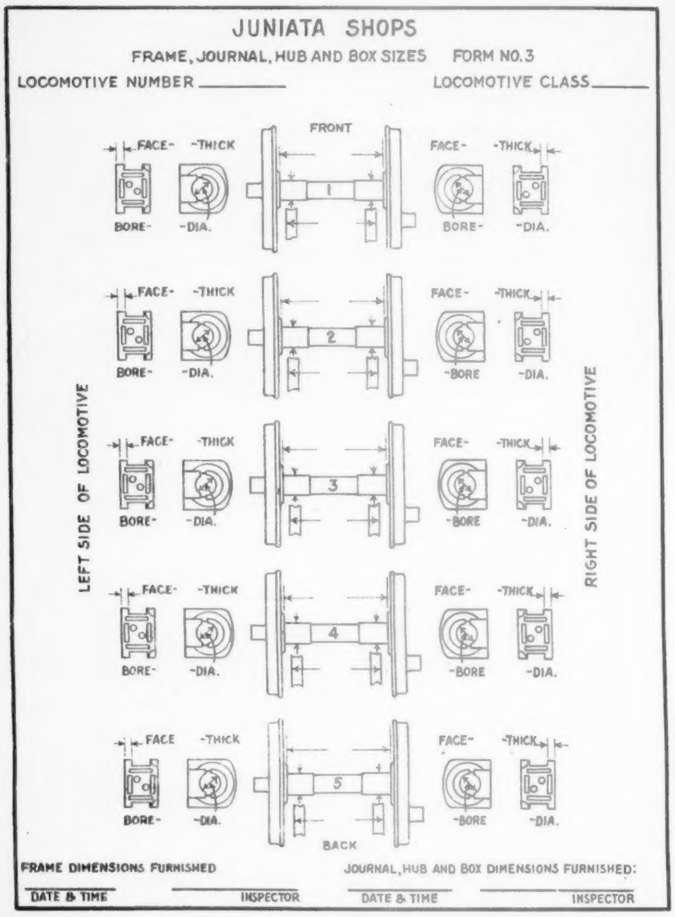
not come in contact with the journal. The finishing cut is then taken and at the same time the fillet is turned on the brass with the back side of the side head tool. The



Turning two driving box brasses in a lathe at one set-up

cellar is removed and after resetting the box and tool, an axle clearance cut of .02 in. is taken from the bottom part of the brass sides. After the completion of these operations, the diameter of the bore is checked with a special

three-pronged micrometer shown in one of the illustrations. The box is then removed. Attention is called to the fact that the only measurements made are after the completion of the machine operations, a condition made possible by the micrometer measurements. The advantage of the method is reflected in the time taken to complete the boring and facing of a driving box, which under every-day conditions is less than 25 min. from floor to floor. Owing to the close tolerances to which the work is done, the operation of spot facing to the journals is not necessary. After this operation, grease grooves are milled in the crown brass and the box and cellar assembled and



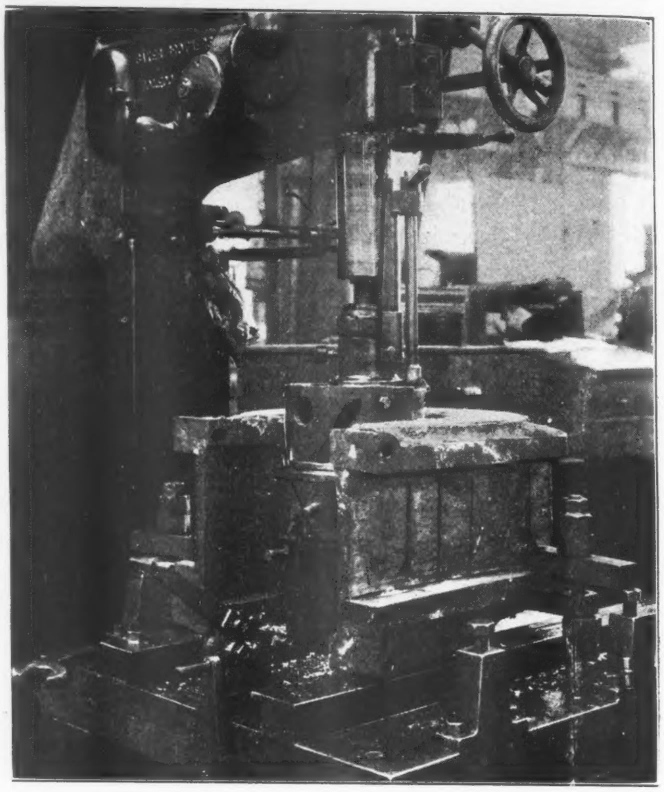
The dimensions set down in this form are used by the driving box gang

delivered by a jib crane to the wheel gang. The method of handling boxes is typical of the manner of sequence in which the different repair operations are performed on the locomotive parts.

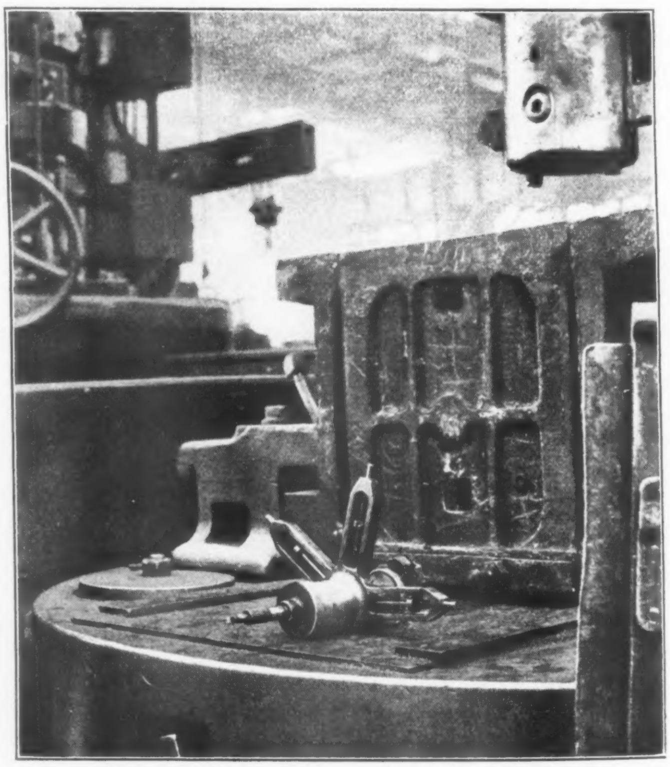
The valve motion work is sent to the proper repair gang where all the parts are checked for size by means of micrometers and gages. Particular attention is given to the piston valves. They are dismantled and checked by limit gages and if found below the limit they are scrapped. The bull rings are fitted up with packing rings according to the size of the valve bushings, which are bored out twice in steps of ⅛ in. each before renewing, giving a maximum diameter ¼ in. over size. The boring heads for this work are kept in the toolroom where the tools are ground and set to bore the proper diameter of piston valve bushings.

Conclusion

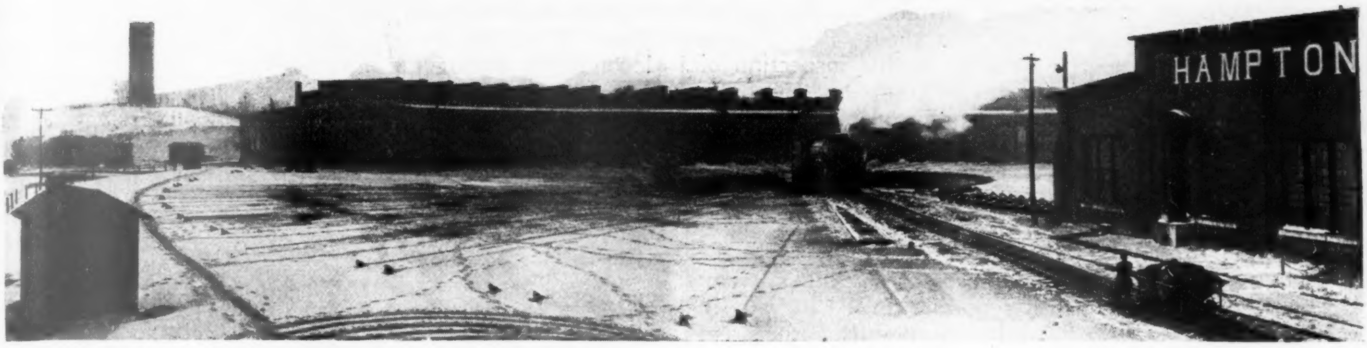
The arrangement of the shop layout, the selection and location of the machine tools and shop equipment and the methods of handling the work which were described in this article were planned by the officers of the mechanical department under the direction of J. T. Wallis, chief of motive power. During the month of December, 1925, which contained 22 working days, 102 locomotives received classified repairs. In this number were two Class 1, 16 Class 2, 30 Class 3, 17 Class 4, 25 Class 5 and 13 heavy running repairs.



Jig for milling the grease grooves in a driving box brass



One of the boring mills for machining crown brasses—The three-pronged micrometer shown is used by the operator to determine the final bore in thousandths of an inch



View of the Hampton engine terminal, Delaware, Lackawanna & Western, Scranton, Pa.

D. L. & W. engine terminal at Hampton

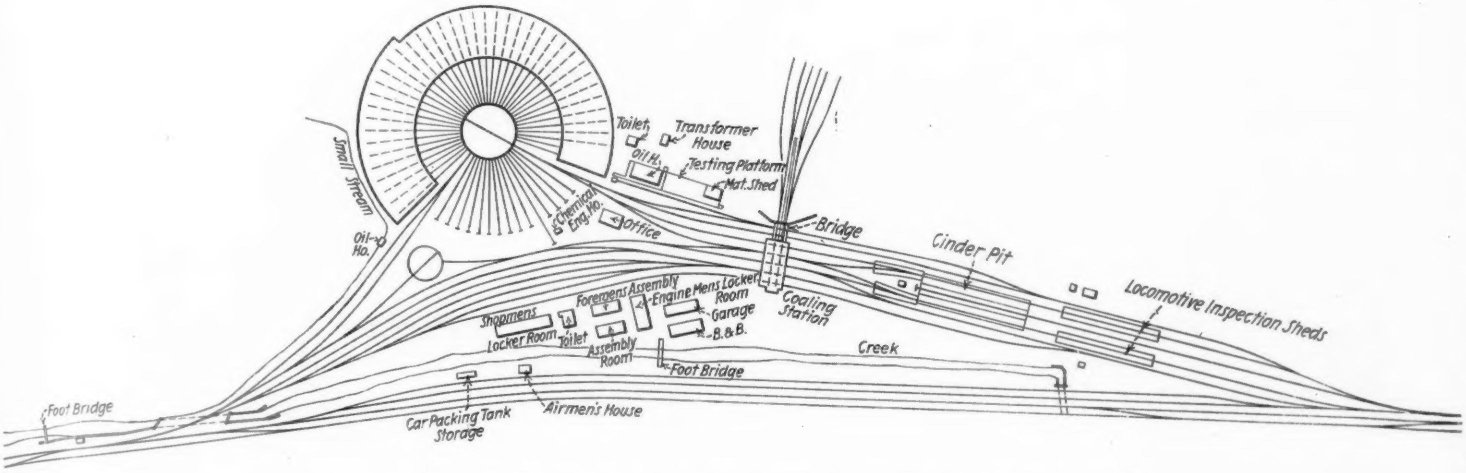
Is equipped with inspection sheds, ash pits, gravity coal chutes, and other mechanical features of improved design

By M. R. Feeley

Master mechanic, D. L. & W., Scranton, Pa.

In order to accommodate the large amount of freight traffic handled from the Keyser Valley branch and adjacent territory, the Delaware, Lackawanna & Western constructed a 41-stall enginehouse at Hampton, located just outside of Scranton, Pa., which was placed in operation May, 1910. The larger part of this traffic consists of practically the entire output of anthracite coal from the Glen Alden Company's mines, as well as a number of smaller individual operators. The yards of the terminal which the Hampton enginehouse serves are approximately five miles in length, with 92.7 miles of yard tracks having a capacity of approximately 12,000 cars. To simplify operation, the yards are divided into east and westbound yards which are in turn subdivided into receiving, classification and caboose yards. A car repair yard of ten tracks is also included in the layout which has a capacity of 150 cars. Hump facilities are provided and are used mainly for classifying the coal, but they are also used for classifying westbound freight. All other car movements within the yard are made by flat switching.

In normal times the Hampton engine terminal is required to repair and turn from 60 to 70 locomotives in 24 hours and to turn as many as 85 locomotives in rush periods. Practically all of these locomotives, with the exception of a small number of switch engines, are of the Mikado type.



Layout drawing of the tracks and buildings of the Hampton engine terminal

Referring to the layout drawing, locomotives are brought by the engine crew to the locomotive inspection shed. They are routed from the inspection sheds past the water crane, the location of which is shown in one of the illustrations, over the cinder pits to the coaling station. From this point they can be diverted either to the enginehouse or to the O.K. track. Locomotives going into serv-

ice are taken out of the engine terminal at the opposite end from the locomotive inspection shed. Fig. 1 shows a Mikado type locomotive arriving at the inspection pit. When the engineman leaves the locomotive at the pit on completion of the trip, he immediately consults the inspection pit foreman as to any conditions that should receive attention. While this inspection is going on, the tool boy, who is shown ascending a ladder on the rear of the tender, inspects conditions in back of the cistern, fire tools, engine equipment, etc. He immediately reports any tools that are missing in the regular equipment or any other irregular condition. When such a report is turned in, it is investigated with the enginemen before they leave the premises. All engine equipment is removed immediately on the arrival of the locomotive and is returned shortly before the time of departure. The man in charge of filling the lubricator and flange oiler is shown ascending into the cab for the purpose of filling the lubricators, etc. The work of filling the grease cups on the running gear of the locomotive is also taken care of by this man.

After this work has been completed, work reports are made out by the engineman and outside inspector which are forwarded to the enginehouse foreman by a pneumatic tube system. The inspection pit terminal for this tube system is located in the larger of the two small buildings, located north of the locomotive inspection sheds. After the outside joint inspection has been made, the locomotive is moved into the inspection shed. Fig 2 shows a locomotive in the inspection shed with an inspector checking up the height of the coupler, a mechanic packing engine truck boxes, the front end inspector opening the smoke box door to make his inspection, and a machinist tightening the left front steam chest cover. While work of this nature is going on, the inspection pit foreman makes a thorough inspection of the locomotive while standing over the pit and this report is forwarded to the enginehouse foreman by pneumatic tube. If no enginehouse repairs are needed on the locomotive, an "O.K." flag is placed on the front end which indicates that it is available for service. If the locomotive requires any heavy repairs, the inspection pit foreman places a flag marked "R.H." on the front end. These flags notify the hostler the disposition of the locomotive and he is able to take the locomotive to the enginehouse or "O.K." track after the work in the inspection pit has been completed without having to wait for instructions from the inspection pit foreman. If the inspection pit foreman is satisfied that the locomotive can be prepared for service within a short period of time, he immediately notifies the enginehouse foreman that it will be ready at a specified time. This system especially facilitates the turning of locomotives during the busy season.

Prior to the installation of these inspection sheds, the fires on locomotives were cleaned upon arrival on the ash pit. The locomotives were then washed, coaled, sanded and placed in the enginehouse where the inspectors would go over them, the work report slips would be distributed and the necessary repairs made. A close check was kept on this system for a period of six months which showed that the average time for turning a locomotive was nine hours. Since the inspection sheds have been placed in operation, with the resultant change in the system of handling locomotives, the average time consumed in fully preparing a locomotive for service from the time of its arrival off the road, has been reduced to three hours. It is not, of course, possible to have all locomotives turned in this time. Quite a number must be taken into the enginehouse for boiler wash, drop pit work, rod bushings, cylinder packing, etc., but 60 per cent of all the power going over the pit is available for service and can be turned without being taken into the enginehouse.

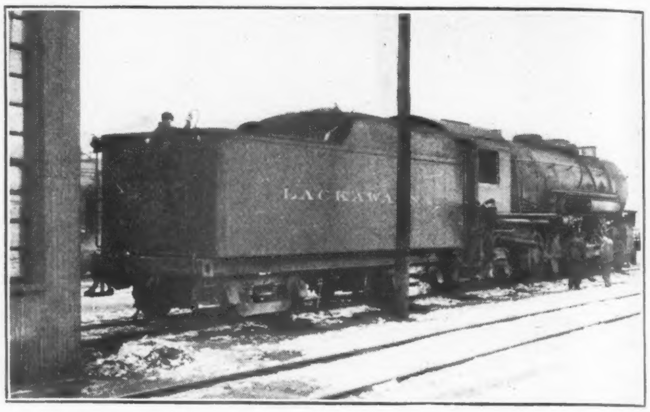
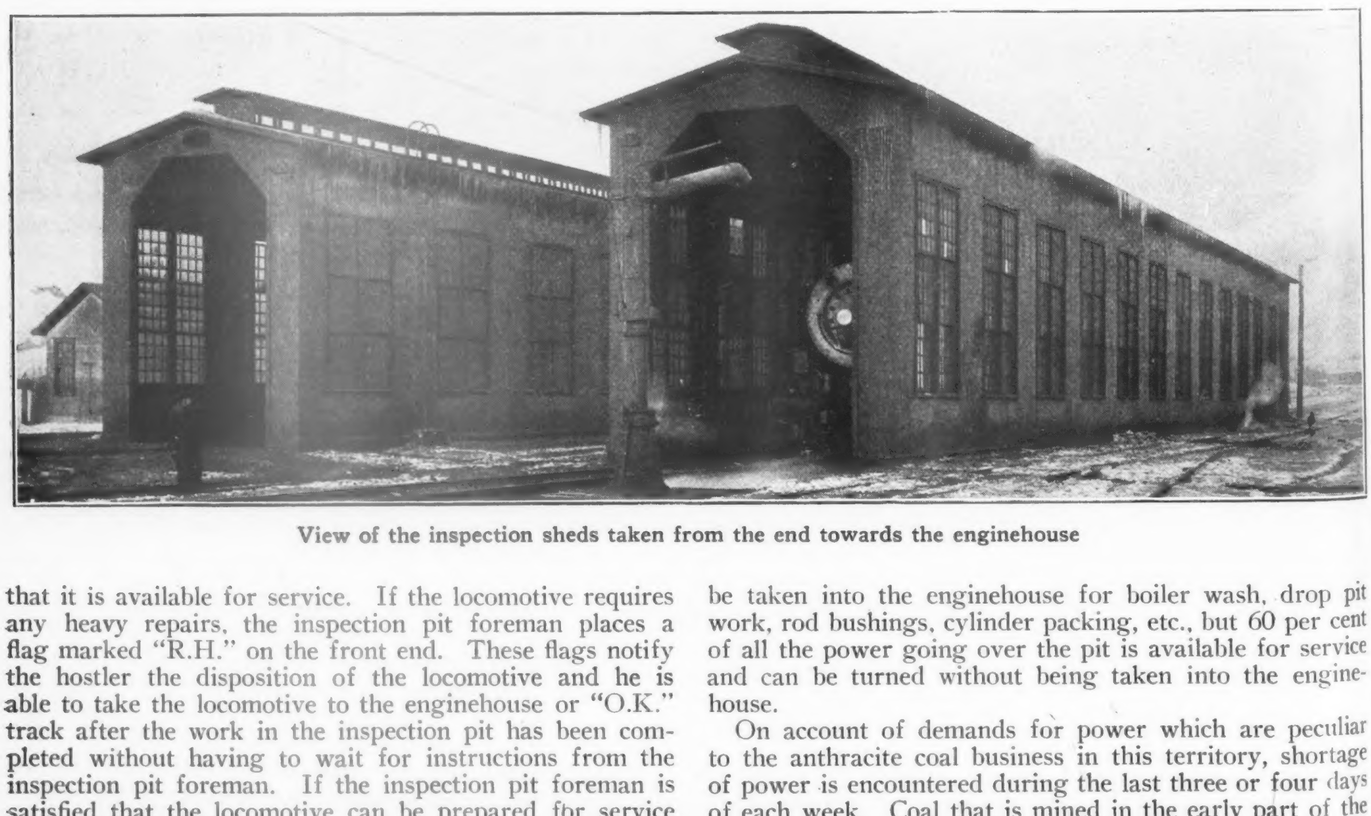


Fig. 1—Arrival of a locomotive at the inspection pit—The engineman goes over the locomotive with the outside inspector before making out his work report



View of the inspection sheds taken from the end towards the enginehouse

On account of demands for power which are peculiar to the anthracite coal business in this territory, shortage of power is encountered during the last three or four days of each week. Coal that is mined in the early part of the week accumulates in the yard and the transportation de-

partment, of course, desires to expedite the movement of this business. As a result, arrangements have been made to take care of as many heavy-repair locomotives, boiler washing, etc., on the first three days of the week so as to permit the turning of all power in a minimum time in the latter part of the week. On Mondays, Tuesdays

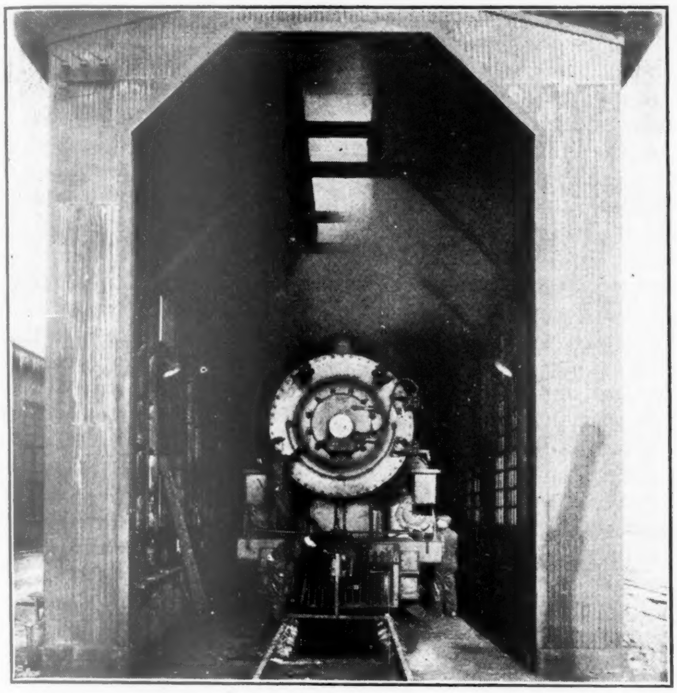


Fig. 2—A locomotive in the inspection shed—If repairs are required an "RH" flag is placed on the front end, if not an "OK" flag is placed as shown in the illustration

and Wednesdays, nine gangs are employed in the house. On Thursdays, Fridays and Saturdays, three of these gangs are taken outside to assist in the work of turning locomotives and only six gangs are used in the engine-house. It has been through the operation of this system that it was determined that 60 per cent of the power was turned on an average of three hours following its arrival at the terminal.

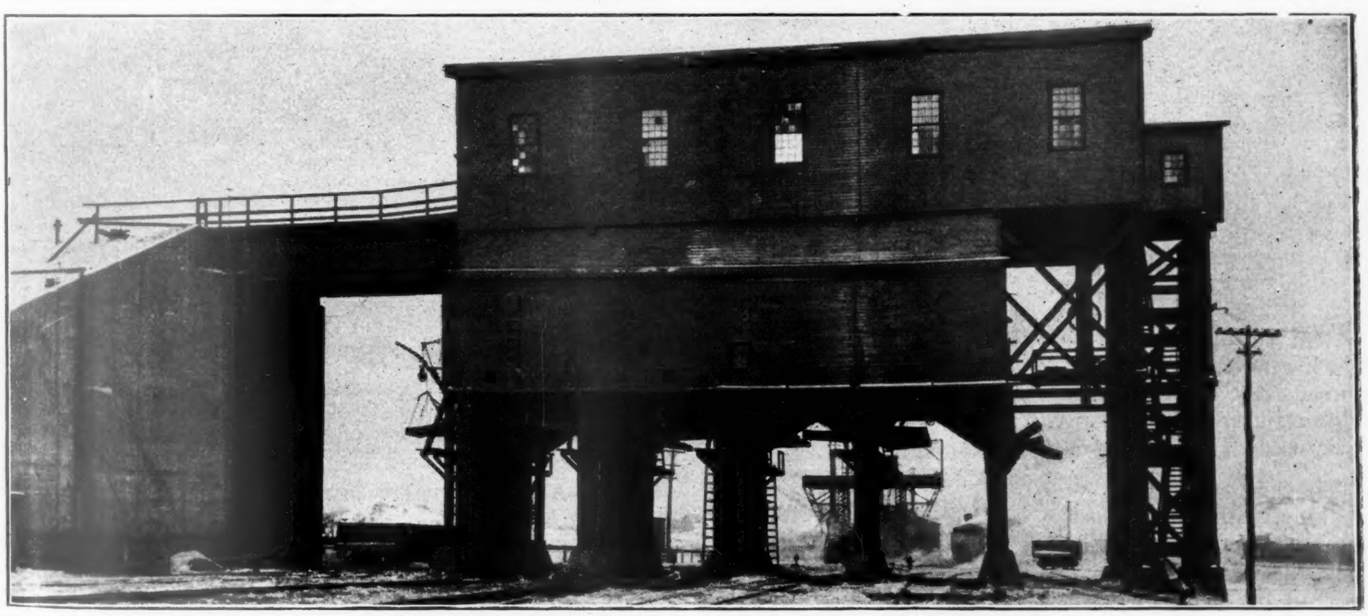
The inspection sheds are well equipped

Each of the inspection sheds are equipped with work benches located at each end where all necessary tools are provided for the man assigned to work there. The sheds are lighted by a system of flood lights placed on the walls of the shed so as to provide plenty of light on the side of a locomotive. Two of these lights are shown in Fig. 2, immediately inside the entrance to the inspection shed. A series of flood lights are also placed inside of the walls of the pits which provide excellent illumination, both day and night, underneath the locomotives. Each inspection pit is 175 ft. long and can accommodate two Mikado type locomotives.

Located adjacent to the inspection sheds is a frame building which is used jointly as an office for the inspection shed foreman and a supply room. It is provided with a telephone and is the terminal for the pneumatic tube system referred to in a preceding paragraph, through which work reports are delivered from the work report book clerks in the enginemen's board room. An annunciator is placed outside of the building for the purpose of calling the foreman when the telephone in the office rings. This can be heard at any point in the inspection shed so that the foreman can easily respond to a telephone call when wanted. All the supplies required on the inspection pit are kept in the store room compartment of this building. This compartment also contains a portable piston packing boring machine to handle the boring of all valve stem and piston packing for the handling of locomotives on the inspection pit.

Close to this building is a steel cupboard for the storage of lubricants used on locomotives that are prepared on the inspection pits. All lubricators are filled, engine truck, driving and trailer truck boxes packed, rod cups filled and stokers and boosters from this source of supply. Stokers and boosters are oiled at regular intervals and each locomotive is checked up daily to see that this particular item has been performed according to schedule.

All the leads on the incoming and outgoing tracks are equipped with water cranes conveniently located for the filling of tenders on incoming and outgoing locomotives. Two of these cranes are located between the locomotive inspection sheds and cinder pits so that the tanks can be filled as they are started through the terminal.



The coaling station has a capacity of 1,260 tons and has eight pockets

The ash pits are 200 ft. long and are of the sluice-way type covered with metal screens. Ashes are removed with a four-ton Shaw electric gantry crane equipped with a one-ton capacity clam shell bucket. After the fires are cleaned, all locomotives are thoroughly washed on the laundry pits which are located just beyond the ash pits on the way to the enginehouse. The laundry pits are provided with adequate drainage facilities and a catch basin where the dirt that is washed from the locomotives is caught and removed to the ash pit. The washing equipment used is manufactured by the D. & M. Manufacturing Company, Chicago, Ill.

The coaling station has a capacity of 1,260 tons and is provided with eight pockets all of which are equipped with undercut gates. The sand bins are also an integral part of the coaling station so that the sand dome of a locomotive can be filled by the hostler while the tender is being loaded by the coal station attendants.

The enginemen's board room is located between the coaling station and the engine house building. This location makes it convenient for the engineman to file work reports and time tickets. Standard clock service is also provided and a bulletin board is located in the room for the display of all orders and memoranda for the engine crews. This room is equipped with lockers and other facilities for the comfort of the engine crews. The work book clerks, located in the board room, have direct telephone communication with the inspection shed and this is also the enginehouse terminal for the pneumatic tube system through which the work reports are delivered. Work reports received via the pneumatic tube system are immediately delivered to the inspection foreman at the enginehouse.

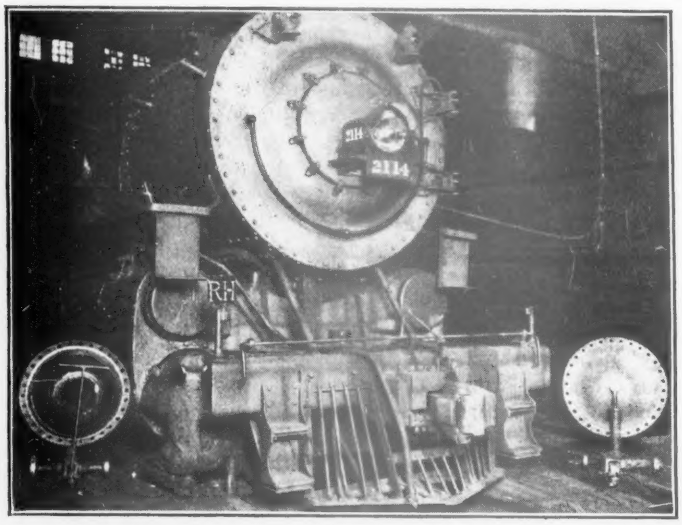


Fig. 3—Locomotive in the enginehouse for work requiring the removal of the cylinder heads

The enginehouse

The enginehouse is of brick construction and has 41 stalls. As shown in the drawing, either end of the building can be extended if necessary so that additional stalls may be added. One of the illustrations shows a general view of the enginehouse. The outgoing lead is shown at the extreme left where locomotives are prepared for departure. The incoming and outgoing leads are lined up adjacent to tracks leading to the enginehouse so that dead locomotives may be moved in and out of the stalls without the use of cables, push blocks, etc. The 100-ft. electrically operated turntable, which was recently installed, is a three-point suspension type with overhead trolley.

The enginehouse equipment includes a 50-ton capacity drop pit table manufactured by the Whiting Corporation. This table was installed about a year ago without any excavation or alteration of the pits, except to spread the rails. This table replaced two pneumatic drop pit jacks. Since its installation, all work on locomotives, such as removing and replacing engine truck wheels, driving wheels, driving wheel tires without stripping the guides, etc., driving springs and saddles, trailer truck wheels, tender truck wheels, boosters, inspection of drawbars and drawbar pins is handled on this pit. By means of this table the front end of Mikado locomotives can be raised for the shimming of the No. 1 and No. 2 tires without any additional jacking. A five-inch lift above the rails is ample to take care of this operation. With this device, the table operator is able to observe the work by riding the table while wheels are being applied and see that the boxes take the pedestal jaws properly. In the application of driving wheels, all jacking of the shoes, wedges and binders is eliminated, as these parts are blocked up on the table. The binders are set on blocks so that they can be run up into position and it is only necessary after they are once in place to tighten up the binder bolts.

Four stalls in the enginehouse are provided with a depressed rail arrangement. All locomotives equipped with boosters are placed in these stalls when due for a boiler wash. The utilization of the depressed rail arrangement permits easy access and easy inspection of boosters, drawbars, drawbar pins, etc.

Fig. 3 shows a locomotive that has been moved from the inspection pit with the roundhouse sign on the front end which indicates to the hostler that the locomotive is to be placed in the enginehouse for repairs. All the work on this locomotive is completed with the exception of the cylinder packing. When this job has been completed, the "R.H." flag is removed and the locomotive is marked "O.K." for service. A number of portable cylinder head trucks, two of which are shown in Fig. 3, have been found quite convenient in connection with removing and replacing cylinder heads.

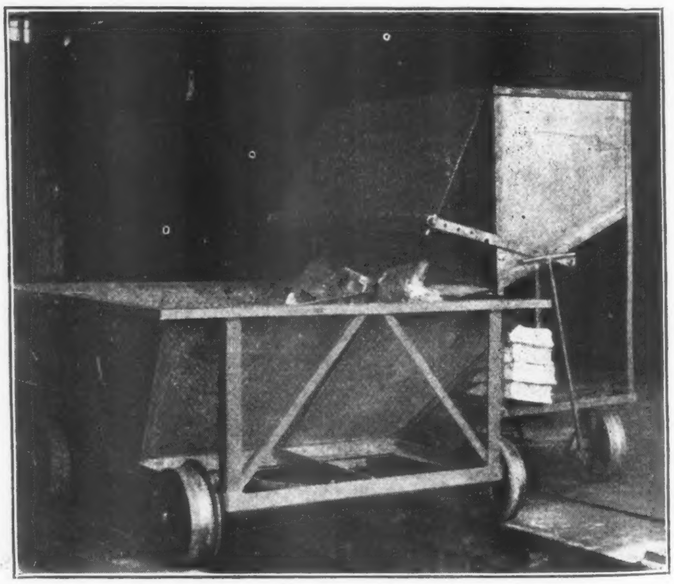


Fig. 4—A special truck is provided for handling arch brick

When the engineman reports a valve or cylinder packing blowing or any other work that is considered in the category of heavy repairs for the inspection sheds, the locomotive is placed on one of the incoming lead tracks and other locomotives are run over the adjacent track,

shown in the drawing, so that the inspection pit man can work on the renewal of the cylinder packing, valve packing rings, etc., while the locomotive is waiting to go into the enginehouse. This system keeps all of the men busy on the inspection pits and assists in maintaining production at a maximum. If the locomotive goes on the inspection pit with a loose front driving wheel tire, all other inspection pit work is completed and the locomotive is moved into one of the stalls of the enginehouse which has the depressed rail arrangement and the wheels are blocked and tires shimmed. In cases where it is necessary to reset tires on the front driving wheels, the locomotive is run over the Whiting electric drop pit table on which the tires are removed and replaced without removing the guides, crossheads or any other interferring parts which are ordinarily removed when equipment of this kind is not available.

The equipment of the enginehouse also includes both electric and acetylene welding and cutting outfits. Practically all of the boiler work is taken care of with electrical equipment and the cutting and other welding is performed by the acetylene process. An electric crane truck is used for the handling of air compressors, placing springs in position, removing and replacing driving wheel tires, etc. This truck is also used for conveying material between the storehouse and the enginehouse.

The machine shop is located in the end of the enginehouse next to the incoming lead tracks. The machine tool equipment consists of:

1 27-in. Lodge & Shipley lathe
1 12-in. lathe
1 26-in. Cincinnati shaper
2 Emery wheels
1 Babbitt furnace
1 Blacksmith forge
1 Steam hammer
1 42-in. Bullard boring mill

To facilitate the work of renewing arch brick, a special truck has been provided which is shown in Fig. 4. This truck is constructed of ⅛-in. steel-plate, supported by a frame of 1¼-in. angles. The different parts have been welded together by the electric process instead of being riveted. In making arch brick renewals, the new brick is piled on a platform underneath the truck bin as shown in Fig. 4 and the truck is wheeled alongside the gangway of a locomotive. The top of the truck is 80 in. from the floor which brings it to an approximate level with the floor of the cab. Old and broken brick is placed in the truck bin which is 35 in. wide and 60 in. long, the floor of which is built sloping to one side. The bin is provided with a door which opens outward as shown in the illustration so that the scrap brick can be easily removed into the hand car. The slope of the floor of the bin is 12 in. in 35 in. and the door of the bin has been placed at such a height that the scrap brick will slide into the hand car without extra handling. The hand car shown in Fig. 4, is used to handle refuse which accumulates on the floors and pits of the enginehouse. It is equipped with drop-bottom doors and has a capacity of about three tons. All dirt and refuse is loaded into these cars which are moved to the ash pit for unloading at opportune times when the tracks are clear.

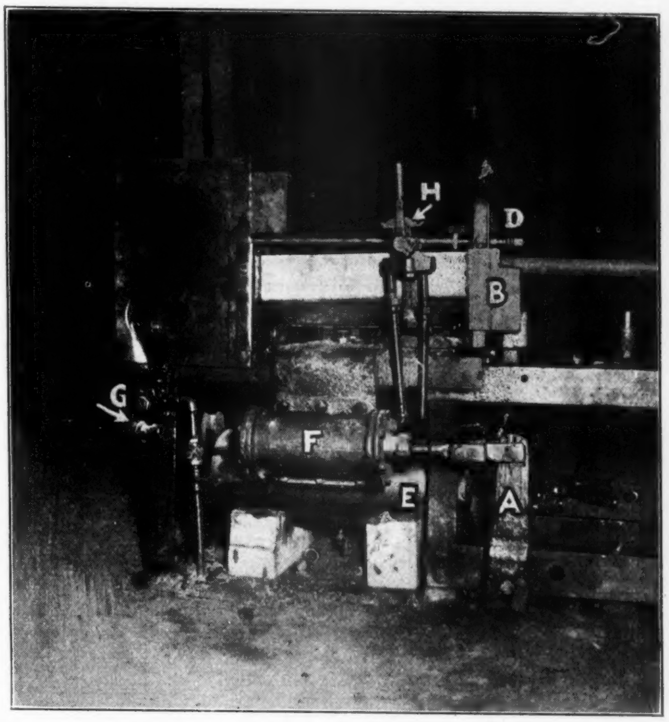
The enginehouse is also equipped with a Miller boiler washing system which is used for washing and refilling the boilers of locomotives.

East of the enginehouse is the enginehouse employees' locker and wash room and located adjacent to this building are similar facilities which are provided for the engine crews. These wash rooms are equipped with steel lockers and modern wash-room and toilet facilities. Standing at right angles to this building is a cafeteria where enginehouse employees are served luncheons by the local railroad Y. M. C. A. at moderate prices.

The Hampton engine terminal has been planned with ample room and necessary details for increasing its capacity when business requires. The enginehouse has been designed so that additional pits can be installed if necessary and the coaling station is also constructed to permit increasing its capacity. As a matter of fact, all facilities have been planned and installed with the view of possible future enlargement, and in the provision of such additions it will not be necessary to make any changes in the present track arrangement, or in routing locomotives through the terminal.

Device for cutting off flue ends for welding

The accompanying illustration shows a device for cutting off flue ends for welding. It consists of a piece of ¾-in. by 12-in. flat iron, bent to a right angle and bolted to the frame of a flue cutting machine. To this is bolted a 6-in. by 14-in. tank brake cylinder, which is changed from a double end to a single end pressure by removing the front packing leather and boring a ¾-in. hole in the front end of the cylinder. A strong coil spring is placed on the front end of the piston in order to provide



Machine for quickly clamping flues when cutting off the ends for rewelding

a quick release for the roller block *B*, in which the flue revolves.

In order that any desired pressure might be applied to the flue that is cut under the knife *D*, it is necessary to have the piston under accurate control. This is done by applying a locomotive feed reducing valve *G* to the shop air line and reducing the shop pressure down to 35 lb. in the auxiliary reservoir *E* located under the machine. The air is then piped to the straight air brake valve *H*, then to the rear end of the cylinder *F*. The roller block *B* is pressed against the flue by the operation of lever *A*, one end of which is connected to a shaft which extends across the lower frame of the machine. The end of this shaft is

connected to a perpendicular push rod which is connected to the roller block *B*.

This air operated device firmly holds the flue against the cutter and greatly speeds up the work of cutting off flue ends.

A locomotive air brake feed valve test rack

THE locomotive air brake feed valve test rack, shown in one of the drawings, is being used in the enginehouses and four main shops of an eastern railroad. It is equipped with a device for clamping the feed valve to the rack, which eliminates the need of bolts for that purpose. The detail parts of the clamping device are shown in one of the drawings.

Referring to the assembly drawing of the rack, a diagram of the piping arrangement is shown at the upper right hand corner and a drawing of the assembled rack equipped with the clamping device is shown at the left. The rack consists essentially of three air reservoirs, the larger of which is used to supply air to operate the clamping device, a duplex and single pointer air gage and clamping device, together with the necessary piping, cocks and valves. This equipment is mounted on a bench, the top of which is made of 3/16-in. boiler plate. The front part of the bench rests on two legs made of 1½-in. angle iron and the rear part of the bench is bolted to one end of the operating reservoir as shown in the drawing.

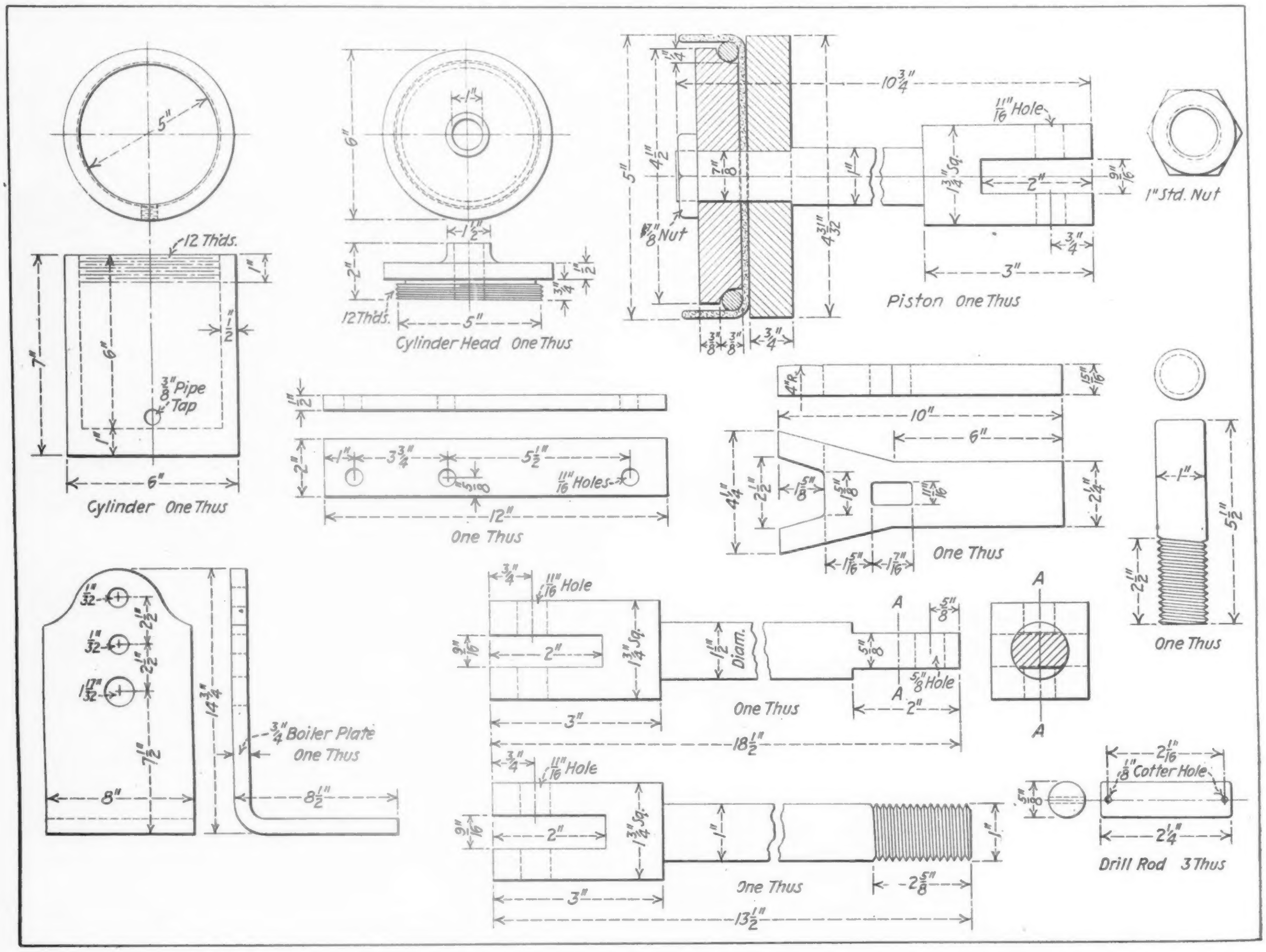
Feed valves are clamped to the test rack and held in place by pressure transmitted from a small air cylinder, the detail construction of which is shown, through a system of levers to a clamp which presses against the cap nut of the feed valve being tested. This clamp holds the feed valve against the pipe bracket and is made with an opening at the bottom which fits over the hexagon portion of the cap nut. The method used for testing feed valves is given in the following instructions.

Instructions for testing feed valves

General—After the feed valves are cleaned they must be thoroughly blown out with compressed air and the parts dried with air blast and rags.

Feed valves must not be lubricated and must be assembled dry. When oil is used to lap in the valves and seats or to reduce friction, the parts must be cleaned and blown or wiped dry before assembling.

Clamp the feed valve to the test rack with only the cap nut applied and with all cocks closed. Open Cocks 2 and 3 to blow out the ports leading to the regulating valve and diaphragm chamber. A strong blow must be had at these ports which indicates that the ports are fully open. Close Cock 3, apply the regulating valve, supply valve and piston to the feed valve and again open Cock 3. Leakage past the regulating valve or supply valve will



Drawing showing the detail parts of the clamping device for the feed valve test rack

cause a blow at the regulating valve stem or small port in the diaphragm chamber. Leakage between the feed valve gasket ports will also cause a blow at the small port in the diaphragm chamber, so the gasket must be known to be in good condition before clamping the valve to the rack. After the above tests are completed coat the valve and cap nut joints with soap suds to locate any leakage and then apply the diaphragms, ring and spring box.

The operating reservoir pressure shall be 20 lb. higher than the setting of the feed valve undergoing test. Should the operating reservoir pressure drop below the amount necessary to operate the feed valve, open Cock 1 and adjust the feed valve undergoing the test, for 20 lb. less pressure than the amount shown on the operating reservoir gage.

Test No. 1—Vibrating test—Commence this test with all cocks closed. Open Cocks 2, 3 and *A*, then tighten the regulating nut until the valve begins to vibrate rapidly. This will be indicated by intermittent puffs of air from Cock *A*.

Allow the valve to vibrate for three minutes, except at shops equipped with a vibrating rack in which case feed valves shall be vibrated for at least three minutes before they are placed on the test rack.

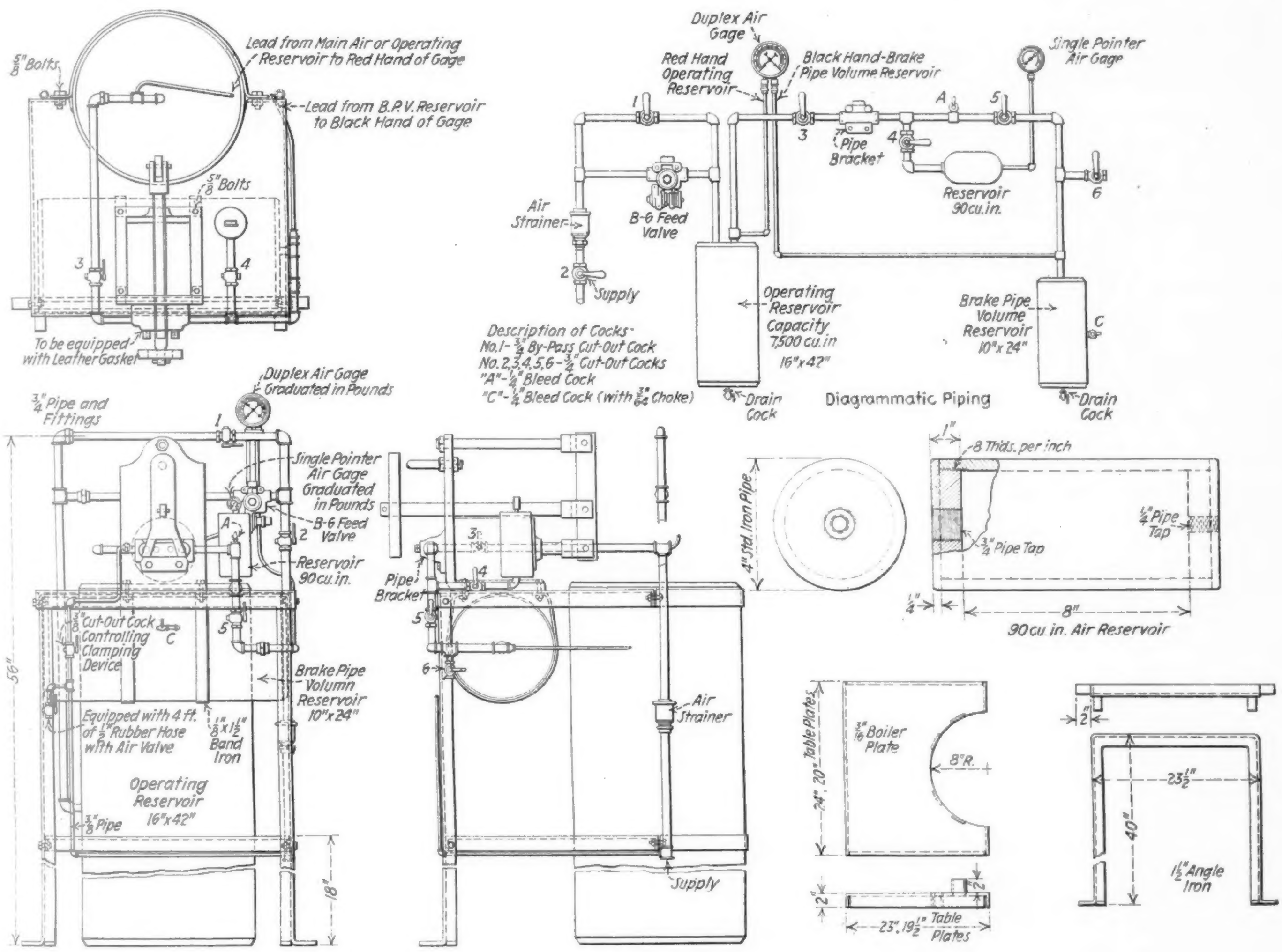
Test No. 2—Supply valve, regulating valve and casting leakage—Commence the test with Cocks 2, 3, 4 and 5 open and Cock 6 closed. Set the feed valve at 70 lb. After charging the small reservoir to 70 lb. close Cock 5. Supply valve and regulating valve leakage will be indicated by a rise in pressure on the small reservoir gage. This leakage should not be greater than 5 lb. in 20 sec.

Should the leakage be greater than the amount specified, remove the spring box, diaphragm ring and diaphragms. Soap the regulating valve stem for regulating valve leakage and the small port for supply valve leakage. In this way the source of leakage may be distinguished. Re-assemble the spring box, diaphragm ring and diaphragm.

Soap the entire valve for leakage. If the cap nut joints are not tight, the valve is liable to overcharge, especially when the piston becomes coated with oil or gum. At the completion of this test, close Cock 4.

Test No. 3—Capacity test—Commence this test with Cocks 3 and 5 open. Set the feed valve to close at 70 lb. Close Cocks 1 and 2 and with 90 lb. pressure in the operating reservoir, close Cock 5 and open Cock 6. Then open Cock 5 and note the time required to reduce the pressure from 90 lb. to 40 lb. This time should not exceed 13 sec. for B-6 and C-6 feed valves and 16 sec. for B-3 and B-4 feed valves.

Test No. 4—Range test—Commence the test with Cocks 3, 5 and *C* open, and the feed valve set at 70 lb. The range between the cutting in and cutting out point should not be greater than 1½ lb. for a shop test and 2 lb. for an enginehouse test. The valve operation should be snappy, cutting in and out several times in a minute. If the range is greater than those specified above, the supply piston is either too tight or too loose. If the



Rack used for testing locomotive air brake feed valves

overcharge on Test No. 5 is excessive, the piston is too tight; otherwise, it is too loose.

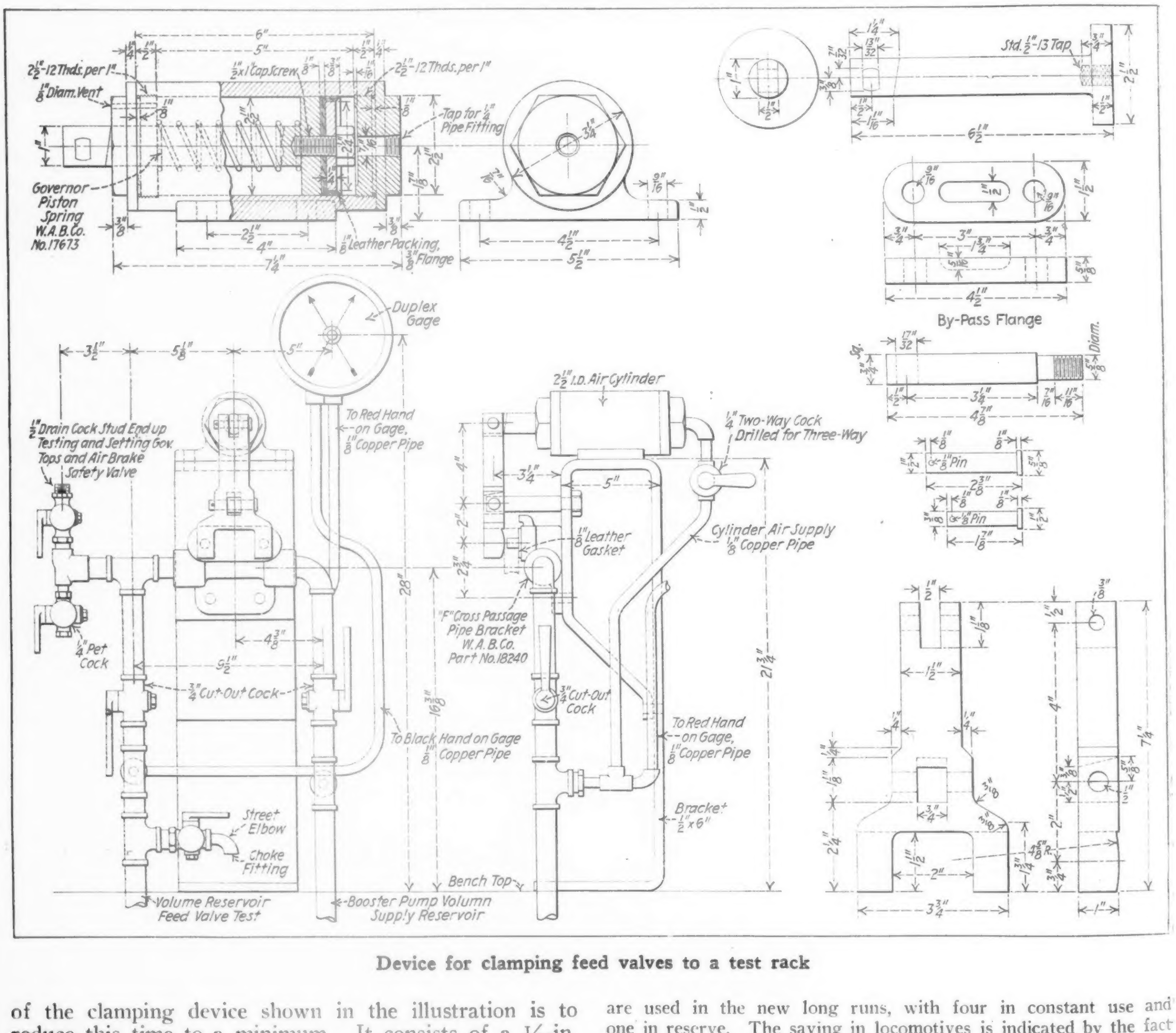
Test No. 5—Overcharge test—Commence the test with the brake pipe volume charged to the setting of the feed valve and then close Cock 3. Open Cock *A* and bleed the brake pipe volume reservoir pressure 5 lb. below the setting of the feed valve. Close Cock A, then open Cock 3 quickly and note the overcharge on the brake pipe volume gage. This overcharge must not exceed 2 lb. At the completion of this test, close Cocks 3 and 4 to remove the valve.

Feed valve test rack clamp

By H. J. Duernberger
Air brake repairman, Niles, Mich.

EVERY time a feed valve is put on a test rack two ½-in. nuts have to be put on and removed. This requires considerable of the tester's time and the purpose of the clamping device shown in the illustration is to reduce this time to a minimum. It consists of a ½-in. by 6-in. bracket mounted at the rear of a work bench and for convenience about 3 ft. from a bench vise. A 2½-in. inside diameter air cylinder is bolted to the top of this bracket. The fork shaped clamp arm swivels on a ½-in. pin which passes through the end of the 1-in. air cylinder piston. The clamp arm fulcrums on a ⅜-in. pin which passes through a ¾-in. square stud located 4-in. down from the center line of the air cylinder piston.

The assembled view in the illustration shows the clamp in the set position. When the air is released, the clamp arm moves to an angle sufficient for removing and replacing a feed valve. The by-pass flange shown is clamped on the rack when testing air brake safety-valves or pump governor tops.



Device for clamping feed valves to a test rack

THE SOUTHERN PACIFIC is now running passenger trains between El Paso, Tex., and Houston, a distance of 832 miles, without changing locomotives, and thus exceeding slightly the longest runs previously made on the same road between El Paso and Los Angeles, Cal., 815 miles. The Houston-El Paso run was established on April 4, when the runs of trains Nos. 7 and 8 were extended and the change of locomotives at Del Rio, the former intermediate terminal, was discontinued. The Argonaut, a New Orleans-San Francisco train, was established on the same date, thereby making possible the long runs. Five Class C5 locomotives are used in the new long runs, with four in constant use and one in reserve. The saving in locomotives is indicated by the fact that only a few years ago five locomotives were used to draw a single train from Houston to El Paso, the divisions being from Houston to San Antonio, to Del Rio to Sanderson, to Valentine to El Paso. Thus it took 20 locomotives to handle the four trains making that route daily.

The Reader's Page

Have You a Question? Ask it
Have You an Opinion? Express it

Case hardening Walschaert gear links---a question

PARSONS, Kansas.

TO THE EDITOR:

I get a great deal of help from the articles that are published in the *Railway Mechanical Engineer* and appreciate the opportunity you have given the readers to ask questions in the "Readers' Page."

We are experiencing difficulty in case hardening the large Walschaert valve gear links; that is, preventing them from warping out of shape while straightening to the proper radius, or getting them sufficiently close to the right dimensions so that they may be ground without removing any of the hardened surface.

I feel sure that some of the readers of the *Railway Mechanical Engineer* have been successful in overcoming this difficulty. I would like to hear from them.

MAURICE J. MCCABE.

The future locomotive boiler—A defense of the present type

CHICAGO.

TO THE EDITOR:

The locomotive boiler is wonderful in its simplicity and adaptability, ranging from the "teapots" of the 60's to the Mallet, Santa Fe and Texas types of the present day.

The article on "Future Possibilities of the Locomotive Boiler," in your April, 1925 issue, discussing high boiler pressures and water tube types is interesting and would perhaps be more authoritative, if less assertive, on some rather debatable points.

In discussing objections to a water tube boiler, the statement is made that fire tubes of the present locomotive type boiler are entirely unsupported except at the ends. How about the water support? A 2¼-in. by 20 ft. tube weighs 43.72 lb., but displaces 30.4 lb. of water, reducing its weight as affecting its supports to 13.3 lb. A water tube on the contrary has no such support or discount of weight and may need help in support in the event of service shocks.

The more important points which are debatable are, that water cooled surfaces have chilling effect on combustion and heat transfer and the improvement of that condition by the use of fire brick. Apparently the writer has overlooked or discounts the available authorities.

Let me quote some conclusions from an article by A. G. Christie, Professor of Mechanical Engineering at Johns Hopkins University, published in *Power* of May 29, 1923, entitled "The Influence of Radiant Heat on Furnace Design," and recommend a thorough study of the analysis leading to those conclusions. Professor Christie, in reference to stationary boiler construction, says, "it is not advisable to obtain the highest temperature possible in the furnace, for firebrick walls will not stand such temperatures." "On account of the limitations of brick work, one is compelled to sacrifice boiler efficiency." He recommends for the side walls of furnaces, instead of brick, banks of water tubes with brick only for necessary filling of interstices, or water leg side walls as in locomotives for higher efficiencies.

He quotes Scotch Marine boiler tests, showing 78.3 per cent boiler and furnace efficiency. Another set of tests ran 73.9 per cent to 77.9 per cent hand fired, coal, and 80.2 per cent to 84.6 per cent with fuel oil. Manning boiler tests with powdered fuel showed 82.2 per cent to 86.1 per cent. All of these types have completely water cooled walls and no brick work. Many locomotive tests at the St. Louis Exposition gave boiler efficiencies over 75 per cent and several were over 78 per cent.

It is thus shown by the tests quoted that a large per cent of radiant heat absorption surface in the furnace "has no deleterious effect on furnace temperatures."

Recent locomotive boiler tests, of which the writer is on record, showed that practically a doubling of the coal rate and development of heat units increased the firebox temperature only 18 per cent. There was very slight increase of temperature of gases in the flues and front end. Where did the heat go to? Prof. Christie gives the answer. It was absorbed by radiation, practically direct to heating surfaces in the firebox without materially affecting the temperature of gases in the firebox enroute to the flues, and these gases are mainly inert, not contributing to heat production, but to heat carrying or convection, the only form of heat transmission in the flues, and to some extent re-enforcing the direct radiation while passing through the firebox.

The only practical use of fire brick in a locomotive boiler is as a baffle and reflecting surface where its use, say as an arch, is very beneficial, but it should not replace or obstruct the heating surfaces from the opportunity of heat absorption by whatever mode it is available.

The author's conclusion that burning gases are cooled by premature contact with water cooled surfaces is also without foundation by analysis of front end gases over various rates of combustion. See Lawford Fry's "Study of the Locomotive Boiler."

There is, of course, a high loss of unburnt fuel inseparable from high coal and draft rates, but this combination would have such effect whether the furnace walls were all water cooled or of brick; being mechanical rather than thermal. Increase of firebox and grate proportions are seen on modern power and are giving the benefit of reduced coal rates. The question of necessary draft for air supply with lowest cylinder back pressure is still with us, and far more important than is generally considered.

The author properly ascribes some advantages of circulation of the water of water tube boilers, presumably of the stationary types, which are built around a theory of circulation, both of the water and of the gases, tending to promote safety, uniform structural temperatures, cleaner boilers and increased evaporative efficiency. The serviceability, economy and efficiency of such boilers can very well be studied in comparison with the ordinary locomotive type and it will be found feasible, by well demonstrated means in extensive use, to supply a degree of water circu-

lation corresponding to that in the water tube stationary boiler and obtain corresponding benefit in service operation.

The psychology of the development of railway facilities leads one to believe that the locomotives of 50 years hence will mainly be steam driven and the result of further development of principles now common, but not yet well understood or appreciated.

C. A. SELEY,
Consulting engineer.

The lost circus car

Minden, La.

TO THE EDITOR:

We had a young yard master
Who had been workin' mighty hard,
To get himself promoted
From switchin' in the yard.
He wanted to be super
And, bein' pretty young,
They promoted him train master,
Which put him up a rung.

He was full of pep and vigor,
And he had a lot of brains,
Though he seemed a sort of youngish
To be mastering of trains.
One day we had a circus
A showin' in our town,
And they must get a goin'
As soon as tents were down.

I was mechanical foreman,
And he, the master brain.
'Twas up to me to furnish power,
That would move the train.
The cars were set on one and two,
The crummy, on number three.
The master had the crew lined up,
And came and said to me.

"No use for you to stick around,
Things are settin' jake.
When their stuff is loaded,
I've but three moves to make.
Pull the cars off number one,
And couple into two,
Drag down, pick up the crummy,
And bid this place 'skidoo.'"

When, next morning I came down
There stood a circus car!
I looked around, to see how come;
In each end was a good draw bar,
Everything was right in place
And not a thing a draggin'.
The car was loaded with some tents,
And also, the band wagon.

Some roustabout had pulled the pin
On a car on number two!
And the crew had checked them
In two cuts. (Which ain't no way to do.)
We had to run a special train,
And without a bridle on,
To get that tent and wagon
Down where the show had gone.

With all kinds of supervision:
Three men, all tried and true,
Train master for the circus
With our train master too,
Conductor—with three brakemen—
And yet, they lost that scow!
(Don't say a word about this,
For that guy's our super now!)

J. B. SEARLES.

Lateral motion and engine truck hot boxes

ROCK ISLAND, Ill.

TO THE EDITOR:

The editorial regarding engine truck lubrication published in the February issue of the *Railway Mechanical Engineer* has brought to my mind the experience that I have had with this problem. During the ten years I have served in an enginehouse as a machinist and foreman, I have always noticed that when an engine truck hot box occurred, invariably excessive lateral motion was found. The I. C. C. allows one inch lateral for a swing bolster truck. This means that on a journal 10 in. long 10 per cent of the wearing surface is throwing off the oil owing to centrifugal force. Do you wonder that with ten per cent of the surface always free to throw out oil that the supply becomes exhausted on long runs at high speed? I take it that the trouble is practically confined to the lately established long runs.

Another point not to be overlooked is that the 10 per cent surface is often to receive all kinds of grit and dirt which helps to make hot boxes. I have noticed when we change a pair of engine truck wheels and take up the lateral motion, that the journals run a long time before causing trouble, again proving to my mind that the trouble is in proportion to the lateral motion.

GEORGE H. ROBERTS,
Foreman, Chicago, Rock Island & Pacific.

Individualism in apprentice training

SPRINGFIELD, MO.

TO THE EDITOR:

I have read with much interest the article in your March number by C. Y. Thomas on the standardization of apprentice training.

There is some discussion as to whether or not our public school educational system is catering to mediocrity. In a word, are we not handicapping the brighter pupils by holding them to the standards and progress of the slower ones? The subject has been ably discussed, pro and con, from educational, economic and social viewpoints, and will not be commented upon here, except as one of the possible dangers of standardization in educational work.

The controversy between the proponents of extreme individualism and the advocates of extreme socialism in educational systems is age-old and since it cannot be settled until individuals are standardized—which, Heaven forbid—we work on a compromise by socializing, to a great extent, the elementary schools and individualizing the higher institutions if one may be allowed to so express it.

Regardless of whether we ought to be governed in trade schools by the democratic theory of the greatest good for the whole student body or the individualistic theory of selection and advancement of the fittest, there is no doubt

about the viewpoint of the apprentice receiving trade school, continuation, or vocational training. He is not concerned with a horizontal elevation of a whole craft, but is individualistic to the nth degree. Of course, he is unconsciously fitting into the general betterment scheme, but it is safe to say that this is purely involuntary on his part.

Having in mind this extreme individualism on the part of the average boy at the apprenticeship period, ought there be any attempt at repression of his ego by any standardization of instruction, however slight that standardization may be? This will always be a moot question and the writer frankly aligns himself with the advocates of individualism and against standardization of methods, texts, etc. On the face of it, it would appear that the establishment of a standard text-book on mathematics, for example, would be beneficial; *that* science is based on standardized principles, but even here we run into the snag of individualism since hardly any problem is presented in such language as to be readily comprehensible to all students. Even in the simplest problems we have to adopt a diversity of presentation. We say seven times thirty equals ——; or seven multiplied by thirty is equal to ——; or the product of thirty and seven is equal to ——, and each of these expressions, while meaning exactly the same thing, causes a different mental reaction in various pupils. The cause of these various mental reactions is left to the psycho-analyst for consideration; but that such a condition exists there can be no doubt.

With this in mind, text-book publishers have endeavored to present as great a diversification of treatments of the same principles as is possible without making too bulky a volume; but an exhaustive treatise interesting to every type of student is still a dream of educators.

What has been said about mathematics is almost equally true of mechanical drawing. The basic principles have been standardized to the point where they can be understood, regardless of locality, but they still have to be presented differently to be grasped readily by different mentalities. Hence, a vast number of texts on this nearly standardized subject; all of these texts contain much of general interest and paragraphs or whole chapters of special appeal to some particular group or class.

Admitting that the trouble starts with the author's projection of his own ego into the work—his emphasis on those features that make special appeal to his thought on the matter—it is still doubtful whether any text-book could be made standard even though it represents the thought and work of a committee of educators.

Mr. Thomas' suggestion that conferences between apprentice instructors of various carriers should be held is certainly practical. The teachers, institutes and meetings held in nearly every part of the United States have proven their worth to such an extent that attendance is now generally made compulsory for all active teachers within the district served by the conference on institute.

Now, then, Mr. Thomas, wasn't your unspoken thought about standardization really this: "Bring apprentice instruction on all carriers up to the highest existing standards and then by interchange of instruction methods and ideas set about bettering the best that we now have?" With this thought everyone connected with the transportation industry must be in agreement, or else confess complete indifference to the future of the industry.

Of course, this is suggesting that we set up a "yard-stick" by which to measure what we are now doing in various ways to suit different localities and conditions. The writer admits having worked for many carriers and still having his "yard-stick" system by which he gages the service rendered by the various railways by whom he has been employed.

Will you pardon the pleasantry, Mr. Thomas, when we suggest that the apprentice system which you probably have as your "yard-stick" is almost a model for the entire country and that we do not blame you for measuring the efforts of other carriers in apprentice training by *your* "yard-stick."

The words "almost a model" are used advisedly in the foregoing paragraph, having in mind the varying educational progress in the several states of the Union and hence the varying development of the apprentice material available to the carriers. With the rigid selection of apprentices possible in some sections, it would probably be feasible to transfer the apprentice system of the Santa Fe, bodily, to the railways of these progressive regions. In regions where educational progress in the public schools has not been so rapid, it will probably be some years before apprentice training standards are brought to the point of development of which we all like to dream. In the meantime it would seem to be eminently practical for all of us who are interested to try to formulate, not a set of standards for apprentice schools, but a set of minimum requirements for facilities and courses, which can be amplified to suit the most advanced groups of students and still be applicable to the least fitted. Let's call them "minimum" requirements rather than "standards"; the word standards suggests too much inflexibility in something in which there can be nothing but progression.

Warren Ichler.

Locomotives in Australia—a correction

New South Wales, Australia.

To the Editor:

I wish to correct a statement that appeared in the January issue of the *Railway Mechanical Engineer*, page 19, which stated that a three-cylinder, Pacific type locomotive with a tractive power of 40,000 lb. at present being built by the Victorian Government Railways, would be the most powerful locomotive in Australia.

Certainly this locomotive will be the most powerful Pacific type locomotive in Australia, but the distinction of owning the most powerful locomotive in Australia belongs to the South Australian Government Railways which has recently imported from England, 30 locomotives—10 Mountain, 10 Pacific and 10 Mikado types. The respective tractive forces of the three types are, 51,000 lb., 36,600 lb., and 40,400 lb. You will, therefore see that the Mountain type represents the most powerful locomotive in Australia, and for your convenience I have given the principal weights and dimensions of these locomotives.

Railroad	South Australian Government
Type	4-8-2
Cylinders, diameter and stroke	26 in. by 28 in.
Driving wheels, diameter	63 in.
Steam pressure	200 lb.
Heating surface, tubes	2,190 sq. ft.
Heating surface, large tubes	1,088 sq. ft.
Firebox and arch tubes	331 sq. ft.
Superheating surface	835 sq. ft.
Grate area	66.6 sq. ft.
Stoker	Duplex
Adhesive weight	91.1 tons
Ratio of adhesion	4.00
Tank capacity, gallons	8,000
Fuel	12 tons

C. S. Edwards.

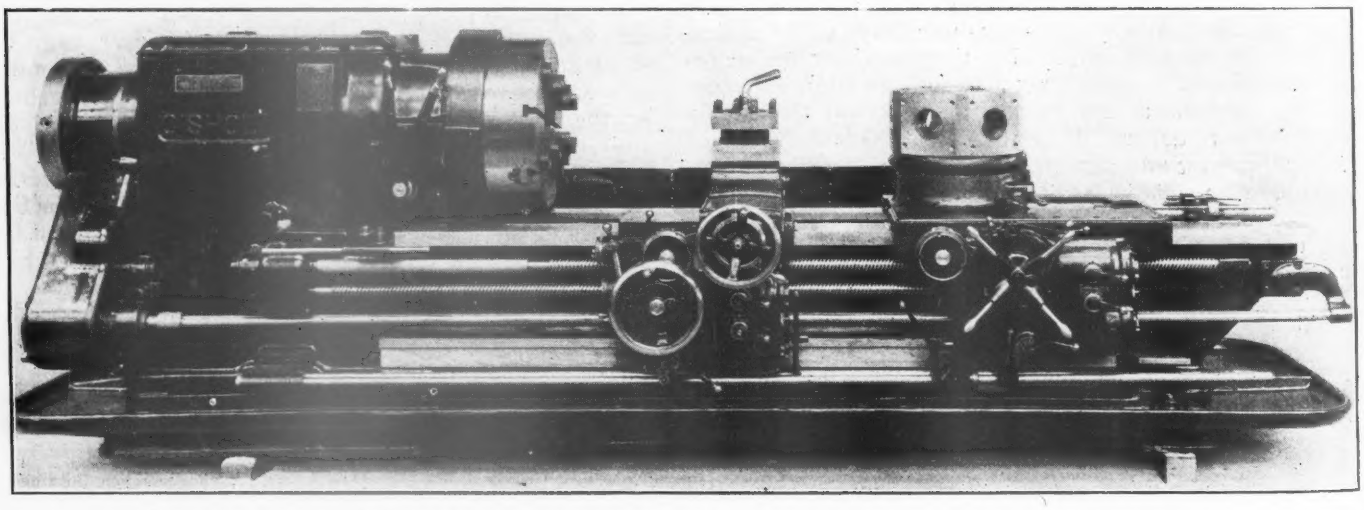
The Great Northern has adopted a plan whereby, with the co-operation of the Pullman Company, the dining, sleeping and observation cars of the Oriental Limited will be remodeled so as to include any new service feature of recent origin. The cars will be sent at regular intervals to the Pullman shops where the new features will be installed. Each of the 10 trains now operated is being furnished with porcelain washbowls.

New features in Gisholt turret lathes

To meet the demands of present day production through greater power and increased ease of operation, a new line of heavy ball bearing turret lathes has been placed on the market by the Gisholt Machine Company, Madison, Wis. Two sizes of the new machines are now in production, the 3L having 21 in. swing and 4½-in. and 5-in. bar capacity, and the 4L having 28 in. swing and either 9-in., 10-in. or 12-in. bar capacity. In each size, two types are available, one with a fixed center turret and the other with a crossfeeding turret, both types having the full swing side carriage with square turret tool post. Either model is adapted for the general range of production work, and the cross feeding turret is especially useful for small lot production, railroad work, toolroom and die work, as it permits the use of extremely simple tooling and quick set-ups. Short, stiff tool holders with forged tools may be used for facing and boring in place of the facing heads and double end boring cutters required where the cross feeding feature is not available.

Notable features of the general design are, ball bearings on all shafts transmitting power, and ball thrust bearings for the main spindle and feed nuts; alloy steel heat treated gears; multi-disc friction and brake; complete independent feeds to each carriage with unit assembly of feed mechanisms; rapid traverse for each carriage independent of the feeds; automatic feed and traverse trips; micrometer dials with observation stops; double bevel turret clamp ring and index bolt operated by one lever; steel forged spindle with bronze bearing boxes tapered in housing for adjustment, and adjustable from outside; and hinged motor mounting.

A heavy cast iron pan supports the machine as a sub-base or foundation. It comprises a series of chambers formed by ribs running transversely and lengthwise, which give the pan rigidity without excessive weight. The chambers next to the edge of the pan are covered with heavy perforated sheet steel secured by counter-sunk screws and presenting a smooth, flat surface. The sheets are supported by bosses projecting from the bottom of each chamber at frequent intervals so that a casting dropped on the sheets or a shovel removing chips will not injure them. As the cutting lubricant falls from the tools upon these sheets, it is strained at once and drained back through the chambers to the central reservoir without accumulating in the pan.

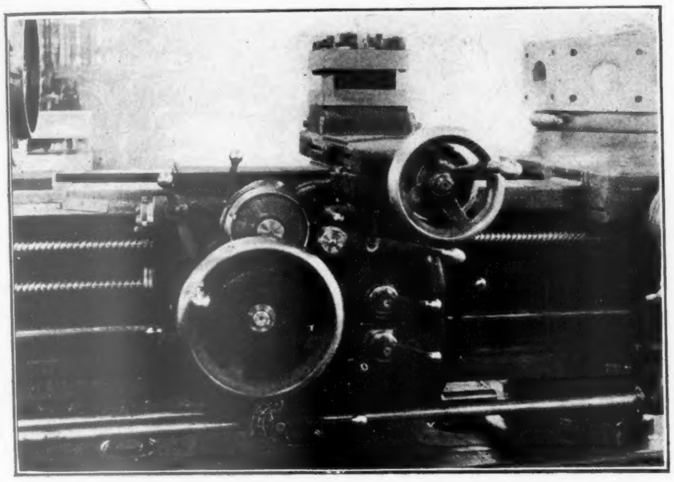


Gisholt high power ball-bearing turret lathe with 28-in. swing and 9-, 10-, or 12-in. bar capacity

The bed of the machine is of heavy box section ribbed laterally every 12 in. with a center rib extending up under the headstock. The ways are wide and flat, both front and back, with an under-cut way low down on the front for supporting the apron of the side carriage. The walls of the headstock have been carried well up above the

spindle bearings and a plate on top presents a flat surface to receive the motor base. The motor base is hinged so as to swing back and give access to the headstock without removing the motor.

The drive is through a 5-in. belt on the 3L machine, from a recommended 15-hp., 1200 r.p.m. motor to a single 18-in. pulley which rotates at 500 r.p.m., and is provided with an outboard ball bearing and is enclosed for safety. On the 4L machine the drive is through a 10-in. belt from a recommended 25-hp., 1200 r.p.m. motor to an



The powerful carriage construction and convenient location of operating levers are evident in this view—Note the separate lead screw to each carriage

18-in. single pulley rotating at 450 r.p.m., and on this machine the motor pulley, as well as the drive pulley, is supported by outboard ball bearings located in the surrounding housing. Sixty-three large ball bearings are used in each machine.

The headstock comprises a drive shaft carrying a double multi-disc friction and a multi-disc brake, an intermediate shaft with the necessary gearing, and the spindle which carried the two driving gears, one on either side and close up to the front bearing. The drive shaft and intermediate shaft are carried in annular ball bearings, and the spindle is held in bronze sleeve bearings tapered on the outside for adjustment. The collars for adjusting the tapered spindle bearings have gear teeth cut on their circumferences, and the wrench provided carries a gear segment on one end. This segment is cut about a hole as a center, into which a sliding pin held in a boss on the front of the headstock is inserted and acts as a fulcrum in adjusting the bearing for high speed work or heavy cuts. This adjustment is made from the front without raising the headstock cover. The spindle thrust is taken on a large ball bearing located just back of the chuck gear.

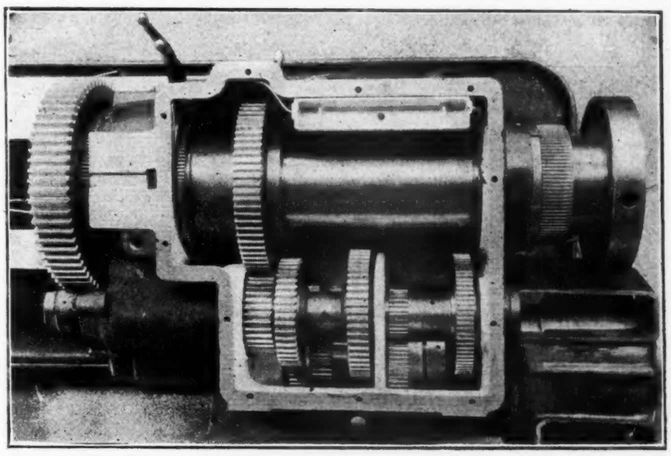
The multi-disc friction on the back shaft is double and is thrown to either side when starting, depending on the speed desired, and when it stands in neutral the multi-disc brake is engaged. Both clutch and brake are made of alternate discs of soft steel and phosphor bronze.

Eight speed changes in geometric progression, ranging from 8 to 257 r.p.m. of spindle, are available. The entire headstock runs in a bath of oil, and a special oil well supplies the front spindle bearings. The chuck gear is keyed to the spindle flange, while the spindle itself has a threaded nose for receiving various types of chucks and fixtures, this nose having a taper back of the thread for centralizing the fixtures or chucks and allowing them to be attached with a metal to metal fit.

The feed train is carried from the spindle on a series of ball bearing shafts down to the feed shaft. A separate lead screw is provided for each carriage, which revolves only when driven by the rapid traverse mechanism. When the carriage is feeding, the lead screw stands still and the feed shaft, through a ball bearing gear train in the apron, rotates the nut about the lead screw. When the rapid traverse is engaged, the lead screw runs ahead of, or in the opposite direction to, the feed, which is still operative at the end of the traverse unless disengaged. Eight reversible feed changes are provided in each apron, and additional feeds may be secured by pick-off gears in the headstock end. Feeds from 1/256-in. to ½-in. per revolution, and all standard threads, are secured through one set of change gears, and special change gears may be provided when required. The hand wheels on both carriages are so geared to the lead screw nut through a differential gear that one revolution of the hand wheel moves the carriage one inch. When thread chasing, the wheel is locked by a plunger pin which facilitates catching the thread at each pass. An observation dial for the longitudinal feed is located on each carriage, graduated and geared to show 7 in. of circumferential movement for each 1 in. of carriage travel, and several adjustable clips are provided on the beveled circumference to act as observation stops. In addition, both carriages are equipped with automatic feed trips and the tool post cross feed dial is graduated in thousandths.

The two aprons are duplicates as to internal parts, and the several sub-assemblies of parts may be removed as units by removing end plates or front plates. The lubrication of the differential gear is from a central reservoir in each apron.

The rapid traverse is at the rate of 40 ft. per min. for each carriage independent of the feeds, and the pilot wheel on the turret carriage is automatically locked against rotating when the rapid traverse is engaged. The rapid



Adjustments of taper spindle bearings, shown with the gear teeth cut on their circumferences, may be made from the front without raising the headstock cover

traverse mechanism is mounted as a unit in the rear of the headstock, and is belt-driven direct from the drive pulley.

Four automatic longitudinal trips are provided for the tool post carriage, six longitudinal trips for the turret carriage, and automatic trips for the cross feed are provided. The stop rod for the longitudinal feed of the square turret is graduated in inches and mounted on an arm that can be swung out of the way when it is desired to have the square turret side carriage pass the chuck.

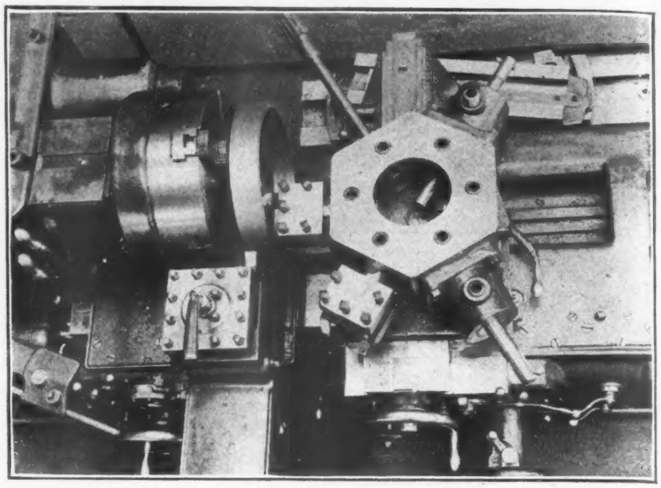
The base of the hexagon turret has a beveled flange with a 12 deg. taper corresponding to a similar taper on

the top of the carriage slide. The two sections of the clamp ring are beveled internally to match, and are drawn together by an eccentric and lever having a mechanical advantage of 80 to 1, thus holding the turret securely against turning or lifting. The usual index bolt for positioning is of course provided.

The six turret stop screws are arranged in groups of three in separate heads. Each head can be moved quickly by withdrawing the pin that positions it in one of a row of holes 1 in. apart, and fine adjustment of each stop is obtained by screwing it through the head. Coarse adjustment is made rapid by backing out a hollow head set screw, to which is attached a segment of a nut, thus permitting the stop to be slid through to approximaely the point desired.

The taper attachment, of large proportions, is attached to the rear of the bed. It will turn tapers up to a maximum of 6 in. taper per foot in lengths of 15 in. On the fixed center turret type of machine, the taper attachment is connected with the square turret on the side carriage; on the cross feeding turret unless otherwise specified by the purchaser.

These machines are regularly furnished with heavy steel body, three-jaw geared scroll chucks, but four-jaw independent chucks, air-operated chucks or collet chucks are available. The bar feed can be furnished, and on the larger machine a power angular feed to the square turret tool post for angles beyond the reach of the taper attachment. The weight of the bare machines is ap-



Turning this view through 90 deg. shows the resemblance to side head boring mill with powerful turret and side head design—Note rugged taper attachment

proximately 11,000 lb. for the 21-in. machine, and 19,000 lb. for the 28-in. machine.

Electro-magnetic automatic furnace

THE process of correctly hardening all steel consists of heating it to exactly the right degree to obtain the finest grain size and then fixing this altered arrangement of the molecules as a permanent structure by quenching the steel in water or oil. The Wild-Barfield electro-magnetic furnace recently placed on the market by the Automatic & Electric Furnaces, Limited, 175 Farring-

A corner of a fully electrically equipped hardening shop

don Road, E. C. 1, London, England, has been designed to obtain correct results when hardening steel.

The equipment consists of an electrically heated furnace and a control panel in electrical connection with it. The furnace consists essentially of a special refractory chamber surrounded by a closely wound helix of alloy wire, the electrical resistance of which produces the necessary heat. A controlling resistance in the circuit of this coil permits of varying the strength of the current and thereby the heat of the furnace. Superimposed on this main heating winding is the secondary or indicator winding electrically connected to the magnetic indicator on the control panel. The whole furnace unit is thoroughly lagged to reduce heat losses to a minimum, and is surrounded by a substantial case of polished aluminum with end castings of soft grey iron.

The control panel, in addition to carrying the magnetic indicator by which a visual indication of the magnetic condition of the charge is given to the operator, it also carried the regulating rheostat for controlling the furnace temperature; the warning lamp of the excess temperature cutout and a pyrometer (if required) solely for regulating the superheat of the furnace.

The electrical circuits of the complete equipment con-

The horizontal bench type of electric furnace

sists of the primary or heating winding on the furnace chamber; the secondary or indicator winding on the furnace casing; the secondary and primary windings of a coil generally designated as the compensator; the moving coil

of the magnetic indicator and the winding on an electro-magnet between the poles of which the coil of the magnetic indicator moves.

Normally an electro-motive force is induced which is opposed and completely neutralized by an equal electro-motive force. As soon, however, as a piece of steel is introduced into the furnace, the electromotive force is augmented by the presence of the steel, the electromotive force opposing it is overpowered and a small current circulates through the moving coil of the magnetic indicator causing it to move on its axis, the pointer generally being deflected across the scale to a stop, against which it vibrates giving rise to a musical note so long as the steel is in the magnetic condition.

As soon as the steel has nearly attained the non-magnetic condition, i.e., the correct point for quenching, the pointer leaves the stop and comes slowly down the scale till finally it stops when the steel has lost its last trace of magnetism.

In addition to the indicator attachment every furnace is fitted with an excess temperature cutout. This unique device consists of a thermal fuse which automatically blows whenever the temperature of the furnace is accidentally allowed to rise to a point likely to endanger the heating windings. When this cutout comes into operation a red pilot lamp on the control board is caused to glow, thus warning the operator, and at the same time the main heating current is switched off.

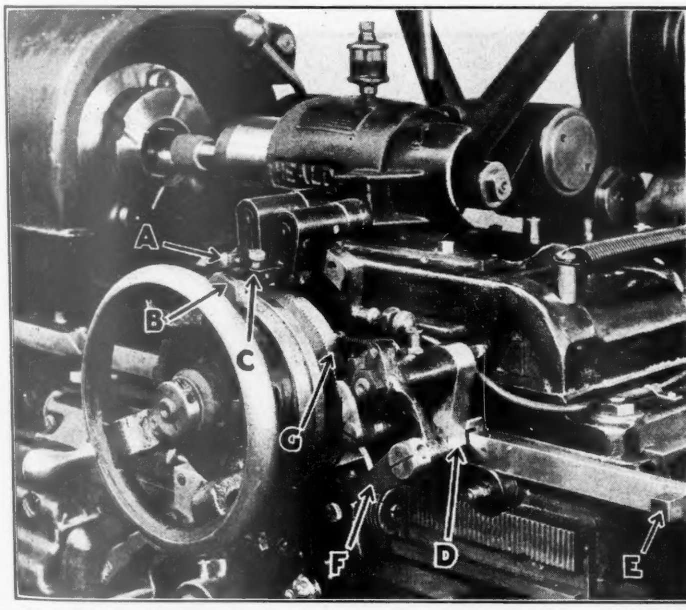
Heald Size-Matic internal grinding machine

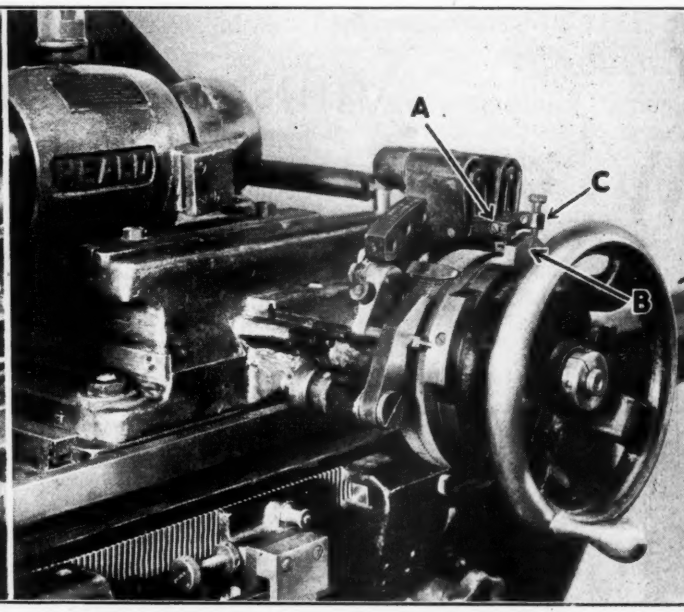
A NEW automatic internal grinding machine known as the Size-Matic has recently been placed on the market by Heald Machine Company, Worcester, Mass. This machine is fully automatic with the exception of loading and unloading the work, and, what is most important, sizes without the use of plugs or gages. It will grind small holes, tapered holes, blind holes or holes with keyways and slots, as well as the average plain straight hole.

The cycle of operation performed automatically by the machine is as follows: After the operator has loaded the chuck, he simply throws over the reverse lever and the wheel goes up to the work at full speed, automatically slows down to roughing speed and with a roughing feed continues to grind until the hole has nearly reached the finished size. Then the head automatically withdraws from the work, the diamond drops into place, the wheel is automatically trued at a truing speed after which it again grinds, the speed having changed to a finishing speed and the feed to a finishing feed.

When the hole has reached the finished size, the wheel automatically withdraws from the work and all units go to the rest position. The operator then removes the work and the cycle of automatic operation is fully completed.

With the Size-Matic, the sizing indicator box used on the full automatic has been eliminated and an entirely new method of sizing has been incorporated, controlled by the diamond and cross slide. As shown in the close-up view of the cross slide, back of the hand wheel is an adjustable ring carrying cam *B* over which points *A* and *C* ride. These points actuate the contacts to the magnet box on the front of the machine which controls the movement of the diamond truing device and the bringing of the machine to the rest position when the piece reaches the finished size.





The left hand view shows the cam and contact points on the cross slide which control the truing and sizing; also the arrangement that compensates for wheel wear—The right hand vie w shows the pawls and arrangement on the cross slide for automatically securing the roughing and finishing feed

Point *A* when riding over the cam *B* controls the truing operation and *C* controls the finishing operation.

There is also a ratchet *G* anchored through reduction gears to the cross slide screw which is operated by the pawl *F* which itself is put in operation by pawl *D* riding over pin *E* as the main table comes out to the rest position.

Having set the diamond to true the wheel at a predetermined point in relation to the finish size of the hole, it then becomes a positive and simple matter to advance the cross slide a definite amount which is controlled by the distance between contact *A* and contact *B* to secure

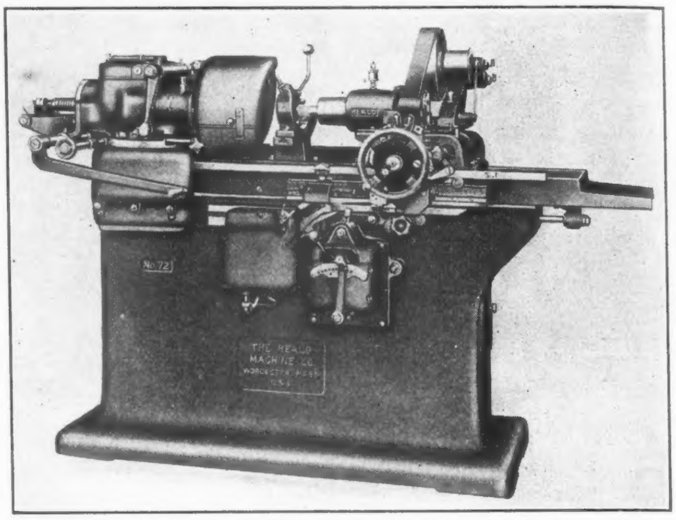
exactly the same size of hole on each successive piece. This is made possible by the fact that it is accomplished under the most ideal conditions for the wheel has just been trued, presenting a clean, sharp surface to the small, definite amount of stock to be removed. The feed is fine and the speed is correct so that with these conditions the result is an exact duplication as long as the relationship of the point of truing and the finish surface remain the same.

The cam *B* is a part of the hand wheel and assumes exactly the same position for each successive piece at the time of truing and time of finishing. Therefore, the number of passes of the wheel through the work is exactly the same on each piece and the above conditions result in continuous duplication.

There is, however, another factor to be considered and that is the wear on the wheel due to grinding and truing. If no change was made in the position of the cross slide relative to the diamond, there would be no stock on the wheel to trim after one hole had been ground and the work would not come to size. To compensate for this wear, the cross slide is automatically advanced between successive pieces as the table comes to the rest position. This, as previously described, is accomplished by pawl *D* riding over pin *E* operating pawl *F* which engages in ratchet *G*, advancing the cross slide .001 or for any amount necessary to compensate for the wheel wear.

In advancing the cross slide by this method, it does not change the relationship of the cam and the diamond so that the results are exact duplication without the use of any measuring device whatsoever.

With this arrangement, where the sizing is independent of the work, it makes the machine as universal as a plain tool. In other words, with no plugs, gages or fingers touching the work the operator is able to handle a mis-

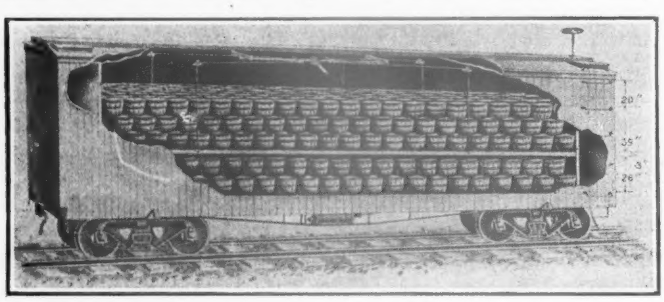


The Heald Size-Matic automatic internal grinding machine

cellaneous class of work as easily as on a plain machine and yet do it automatically. Furthermore, the setting up of the machine is a simple matter so that comparatively short runs of work can be handled advantageously in a railway shop.

Adjustable double deck car

WITH the object of obtaining maximum loading in cars carrying fruit, vegetables, live stock and automobiles, the Shelton Adjustable Double Deck Car Company, Monadnock Building, San Francisco, Cal., have placed on the market an adjustable deck, which can be used in cars hauling the above commodities. It can be installed in refrigerator cars without interfering with the cooling equipment. The double deck is permanent in the standard type of stock car used to carry

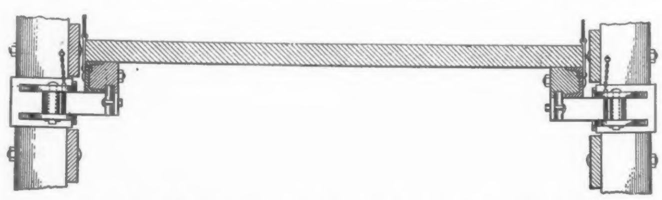


Double deck in position in a car loaded with fruit

small live stock which eliminates it as a carrier for large live stock. Stock cars equipped with the adjustable double deck can be used for the transportation of large and small live stock as the deck can either be lowered to the floor or raised to the top of the car, in which positions it occupies only 4½ in. of the space in the car.

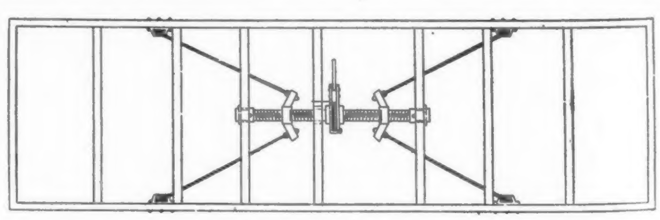
The deck can be installed without any changes in the construction of the car. The operating mechanism does not interfere, in any way, with the utilization of the car for other purposes, nor does it have any complicated parts to get out of order. After the deck is once installed, one man can change the car in a few minutes from a single deck to a double deck, or vice versa. The deck is self-locking, assuring stability and rigidity.

The deck is supported by four wire cables which pass



The parallel side beams of the deck rest on pins located in the end of the brackets—The brackets, when not in use swing out of the way

over four pulleys, two of which are located on each side of the car. The ends of the cables are attached to two yokes through which passes a turnbuckle screw with a



Top view, showing the mechanical lifting parts

right-handed thread on one end and a left-handed thread on the other end. The turnbuckle is operated by a ratchet. This lifting mechanism is shown in one of the illustrations.

Unit heater with fan

A UNIT heater equipped with a motor-driven fan which delivers air through a heating coil and distributes the heated air into the building space to be heated has been placed on the market by the Modine Manufacturing Company, Racine, Wis.

Modine unit heater which weighs only 125 lb.

It consists of three major parts; namely, the condenser assembly, the manifold and frame assembly, and the motor and fan assembly. The steam condenser is of patented construction, made by a special process from selected copper and special materials. This construction provides not only for heat transfer in accordance with the proper principles of thermodynamics, but also provides for free contraction and expansion.

The unit can be quickly taken apart. The condenser can be removed simply by taking out four bolts. The motor and fan assembly can be removed by taking out three bolts. The total light weight of the unit heater is only 125 lb. which results in two advantages. All brackets, braces and structural work are eliminated for it is only necessary to suspend the heater from the steam line by means of a length of pipe and a union. The complete unit can be turned on the union connections for direction of air flow toward the machine, bench, window, door, or wherever desired to suit the immediate heat requirements. Adjustable deflectors may be added to control the downward angle of the heat discharge.

The unit is designed to provide a maximum heat transfer with a minimum weight. The unit shown in the illustration is rated at 165,000 B.t.u. per hour, with 5 lb. steam pressure and a room temperature of 60 deg. F. In operation, the unit forces the heated upper air strata into circulation in the lower working levels and, therefore, maintains a uniform temperature without drafts or other objectionable conditions. Like practically all types of unit heaters, the Modine heater employs the heating principle of convection instead of direct radiation. Approximately 2,000 cu. ft. of air passes through the heater per minute, which is distributed over a wide area instead of being concentrated in the immediate vicinity of the heater.

Hyatt line shaft bearing

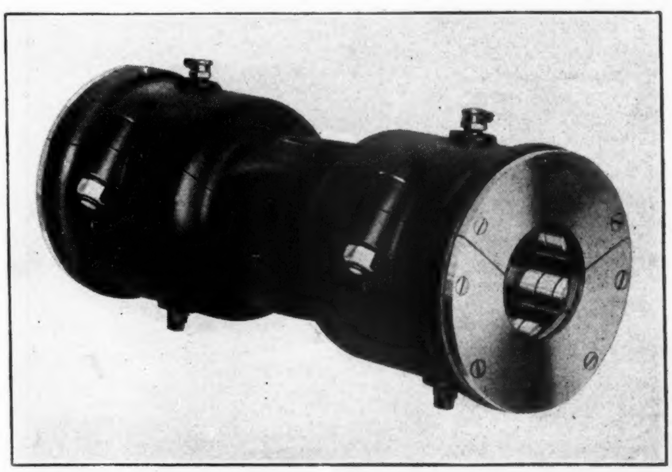
A LINE shaft roller bearing which has a narrow center and is designed to fit all makes of hangers has been placed on the market by the Hyatt Roller Bearing Company, Newark, N. J. It is completely split for easy installation. Although it differs in outward appearance from other Hyatt shaft bearings, the helically wound rollers are still employed.

The box is dumbell in shape, with the twin split roller assemblies mounted at either end. The center section, which is free from bearing surface, is reduced to average plain bearing dimensions, to fit hangers with the narrowest frame openings. The box is built in two sections, the lower part forming two-thirds, and the top, one third. This brings the machined joint well above the oil level and prevents oil leakage. Tightening four bolts seals the sections around a shaft. The bosses are staggered so that the top cannot be improperly fitted. A small wrench is the only installation tool used.

The bearing element is made up in the new series type recently adopted by Hyatt for all high-duty bearings. The bars through each roller maintain equal spacing and alinement and form a stronger cage or retainer.

It is claimed that one filling of lubricant every three or four months is the only attention that this bearing requires. Grit and other substances that tend to break down the oil film are drawn away from the bearing surface through the slots in the hollow rollers.

The bearing may be had in the following five sizes: 1 7/16 in., 1 15/16 in., 2 3/16 in., 2 7/16 in. and 2 15/16 in. For use with larger sizes of hangers requiring bearings up to 4 15/16 in. in the old line of U. G. and B. & S. type Hyatt bearings are being continued in order to have a complete line of bearings.



Hyatt line shaft bearing showing the narrow center

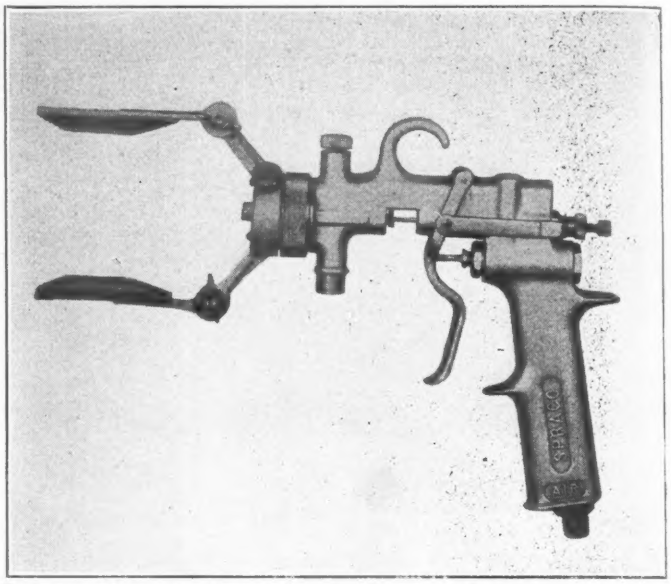
Spraco lobster claw attachment

THE lobster claw attachment for mechanical painting equipment, shown in the accompanying illustration, enables the operator to do such work as the cutting-in of trim; i.e., windows, doors, moldings, wall fixtures, and also the cutting between ceilings and walls, washboards and floors. Two color work can be completed without masking as any desired surface can be protected.

The portable paint spraying equipment consists of a portable container, of 3 to 15 gal. capacity, with a control head for the regulation of air and paint pressures, one or more paint guns, carrying the lobster claw attachment, which can be operated from one head if desired, an all-metal extension pole, air and material hose in lengths to meet all requirements, and a portable compressor and either gasoline engine or electric motor driven, with an air storage tank, gages and safety valves.

An air pressure of 40 to 55 lb. produces the best results from spraying apparatus. By means of a simple hand adjustment of air pressure, paints of different specific gravity may be applied with the same apparatus. The width of the surface covered by the spray when the gun is held 8 in. from the surface to be coated, corresponds to that covered by an 8 in. brush. It is possible to secure anything from a round, conical spray to a broad, fish-tail spray. The solids in cold water paints, bronze solutions, heavy lead paints, etc., are kept in suspension ready for application by means of either an air- or a hand-operated agitating attachment. The operator at all times has both the air and material under absolute control and can operate them at will and apply exactly the needed quantity to the surface to be covered.

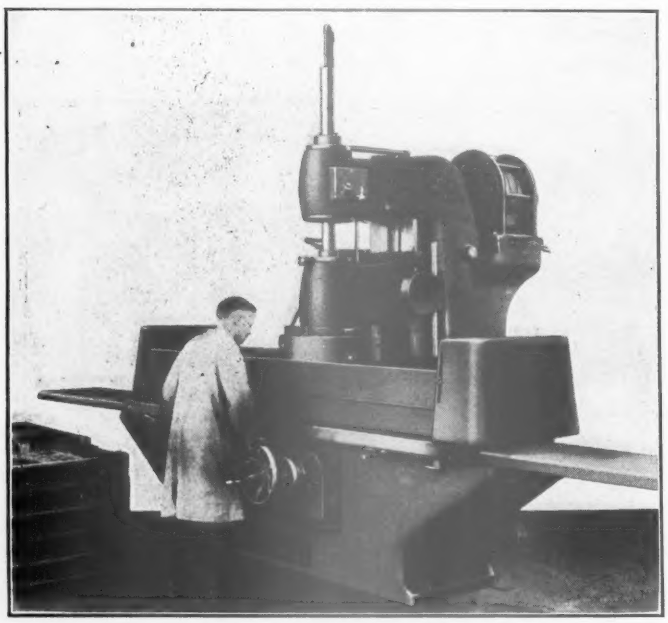
This equipment is marketed by the Spray Painting & Finishing Equipment Sales Company, 60 High street, Boston, Mass.



Lobster claws attachment for the Spraco paint spraying equipment

Improved vertical surface grinders

THE Pratt & Whitney Company, Hartford, Conn., a division of the Niles-Bement-Pond Company, New York, has placed on the market a new design of vertical surface grinders. The new machines are built in 14-in. and 22-in. sizes as were the previous models, and the 22-in machine is furnished with either 4-ft. or 7-ft. beds.



Pratt & Whitney Model B, 22-in. vertical surface grinder

The chief improvement in the new grinder is the method of driving the grinding wheel. The previous model had a belt driven spindle, using a quarter turn belt running from a driving pulley at the rear of the bed up over idlers to a large pulley on the spindle. This arrangement has been satisfactory as a smooth surface grinder drive for a number of years. It has the disadvantage of extreme belt tension, however, which has a detrimental effect on the spindle bearings, and belt maintenance costs are high.

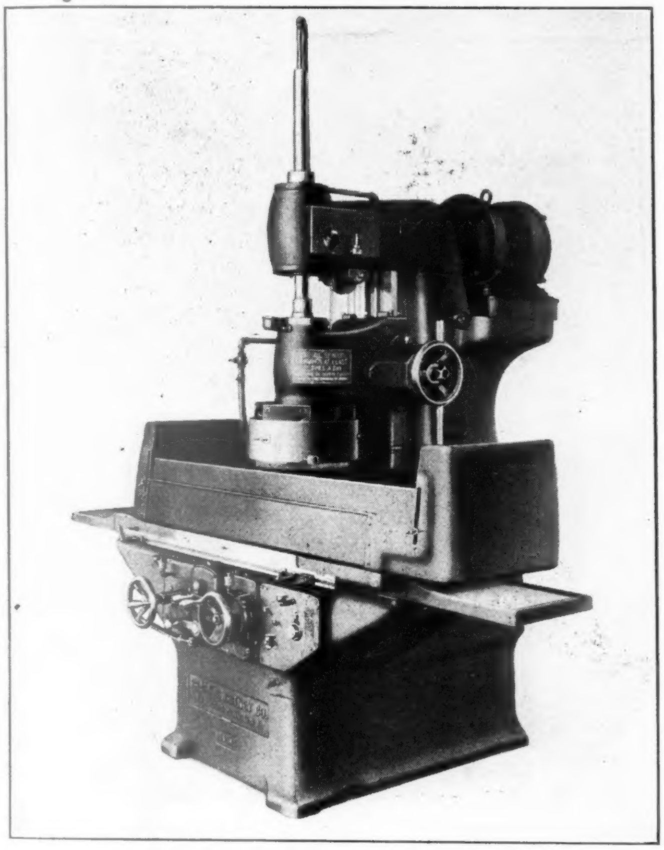
The new design of grinder is motor driven, with the motor mounted on a bracket cast in the rear of the top of the column. This motor drives the grinding wheel spindle directly through a right angle drive using circular bevel gears. The 14-in. grinder requires a 25-hp. 1750 r.p.m. motor while the 22-in. machine takes a 40-hp. 1150 r.p.m. motor. Both motors may be either a.c. or d.c.

In order to mount the motor properly the entire column has been made much heavier and more rigid. The same is true of the wheel head and spindle mounting. The direct result of this stiffening of the new Model B grinder is a much smoother and more accurate action of the machine as compared with the former type. The result of the direct connected motor is a large increase of power at the wheel, without the necessity of heavy belt tension on the spindle.

The design of the grinding wheel spindle mounting has been worked out in conjunction with the ball bearing manufacturers, and the new model is heavier and more rigid in every respect. The entire spindle is mounted on high grade ball bearings which are fully protected from dirt and moisture.

The grinding wheel is mounted on a face plate bolted to the spindle so that it can be easily removed when replacement is necessary. A sheet metal guard covers the wheel to protect the operator in case of breakage, and a wheel band is also provided for additional safety.

The wheel heads of both sizes of machine are over



Model B, 14-in. vertical surface grinder

counterweighted for easy and rapid adjustment, and to prevent the wheel from sagging. As an additional safeguard against wheel sagging the spindle is floated on stiff springs which take up any slight wear which may occur. The grinding wheel feed controls on both sizes are essentially the same in principle but there are some variations which compensate for the difference in size. The 14-in. grinder has a handwheel at the side of the column for rapidly positioning the head. There is also a fine feed hand wheel on the front of the bed by means of which the operator can bring work down to size by hand if desired. The latter handwheel has a ratchet and pawl attachment for power feed. This is operated by the table traverse. The 22-in. grinder has both the rapid and fine feed handwheels on the front of the bed, and has the same general feed arrangement.

The reciprocating table is mounted on one vee and one flat way which are spaced far enough apart to provide ample support. The ways are oiled automatically by spring rollers running in oil wells. The solid top of the table protects the driving pinion and rack from grit and moisture. Guards for protecting the scraped ways on the bed are fastened to either end of the table. Tee-slots are provided for mounting magnetic chucks, work fixtures, etc.

The length of stroke and reversal of the table are regulated by dogs which are adjustable along a tee-slot in the front of the table. A safety dog prevents the table from running off the ways. The reversing gears, clutches and drive shaft are hardened and ground to secure the greatest strength and wearing qualities.

Two table speeds are provided, the operating clutch being controlled by a handle on the front of the gear box. The hand movement of the table is controlled by a large handwheed on the front of the gear-box. This handwheel may be loosened from its shaft by a convenient device so that it will not interfere with the operator when the machine is running.

A cooling solution is pumped through the hollow spindle to the wheel and is thrown between the face of the wheel and the work. In addition the solution carries away the particles of abrasive material worn off in grinding which would destroy the finish if allowed to remain. A supply of solution is also conveyed to the outside of the wheel through an adjustable pipe. The spray is confined by means of adjustable sheet metal guards.

Both sizes of the grinders are suitable for either rotary or rectangular chucks and complete chuck equipment, either plain or magnetic, is available.

The net weight of the 14-in. grinder is 8,990 lb. without the motor, and the 22-in. machine weighs 16,500 lb. and 19,250 lb. net for the 4-ft. and 7-ft. machine, respectively, without motors.

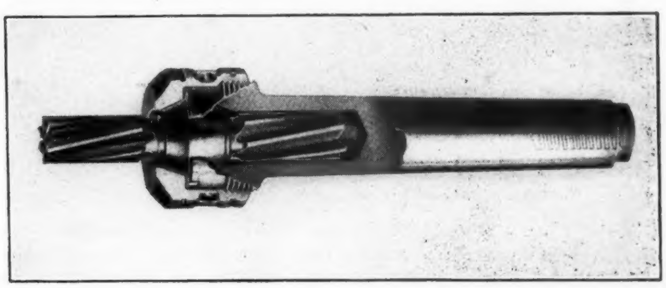
Double end mill without tapered shank

A TAPERED shank is generally used on end mills, which prohibits the use of a mill on each end of the tool. The Thurston Manufacturing Company, Providence, R. I., has placed on the market a double end mill cutter which is held in a special chuck with a lock nut. It is claimed that the mill will not turn in or pull out of the chuck. It is made in all sizes of tapered shanks and is so designed that each size taper will receive double end mills from 1/8 in. up to the capacity of the taper.

A tapered collar, one on each side of the lugs on the center of the mill, serves to center the mill and acts as a friction drive. The principal drive, however, is through the lugs which gives the tool a positive drive.

When the cutter becomes dull or breaks, it is not necessary to go to the tool room for a new one, but instead it may be removed from the chuck, turned end for end and continued the operation.

The double end mills are made in all sizes from 1/8 in. up to and including 1 1/4 in. diameter, both standard and two-lipped. These mills are made of high speed steel.



Assembly of the double end mill with the special Thurston chuck

Pipe and bolt threading machine

The Chicago Pipe Thread Machinery Company, 1615 Racine street, Racine, Wisconsin, has placed on the market a new 1/4 to 2 in. power pipe threading machine for production and portable use. The machine can also thread bolts 1/2 to 1 1/2 in. and drive hand stocks, with the addition of a universal drive shaft; up to and including 12-in. pipe.

The machine is designed to meet all the requirements of a machine of this type and while portable it is a production and precision machine. It is motor driven with the motor direct gear connected, protected from all oil and chips; also any material being handled about the machine—there is a power extension cord with a plug to connect to any electric light socket.

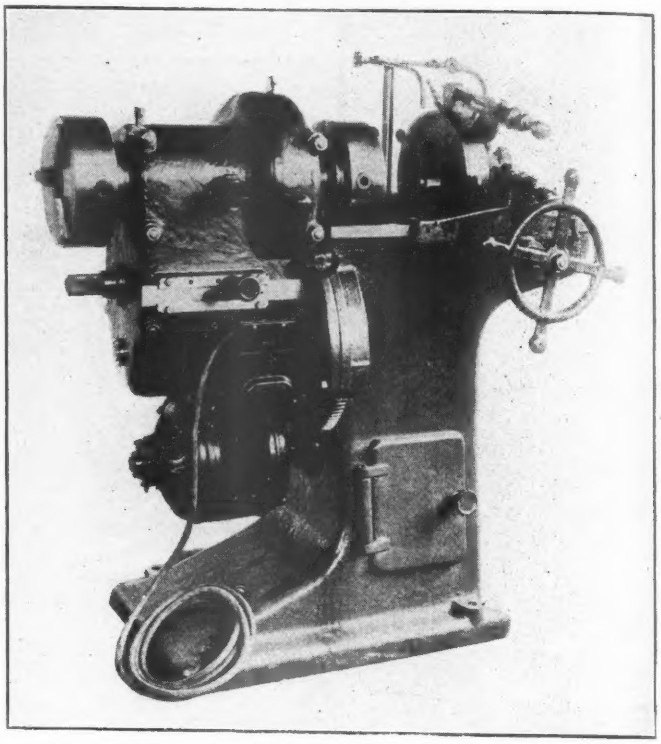
There are three speeds which most aptly cover the range of the machine and obtained through sliding gears and lever control, a clutch for starting and stopping the machine is located on the spindle giving perfect control without reference to either the motors or the gears. All gears are machine cut running in oil and the shafts are of generous dimensions running in bearings that are easily replaced.

The die thread embodies new and novel features—the life of any threading machine is determined by the wear of the die slots. The die slots in this machine when worn can be replaced with little effort and expense.

The quick opening device is most rapid and in the handle is contained the micrometer adjustment for exact, under or oversize threads, as may be required. At the rear of the die head is located the cut-off attachment which is extra heavy to withstand the most severe shocks.

The general design is modern in every respect and represents quite a departure from the conventional—it has a pedestal base in which the oil reservoir is located; also a tool and wrench cabinet for keeping dies, wrenches, etc.

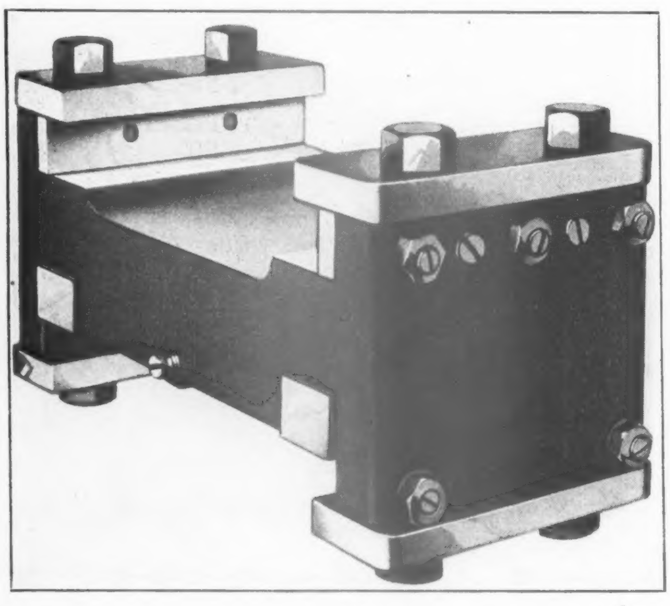
The machine is designed to be mounted on wheels when desired for portable use and it can be readily moved from place to place with little difficulty.



Portable, motor-driven pipe and bolt threader

Universal tools for turret lathes

The Warner & Swasey Company, 5701 Carnegie Avenue, Cleveland, Ohio, has been engaged for some time in redesigning its entire line of standard turret lathe tools. Four of these new tools were described in the *Railway Mechanical Engineer* for April, page 254, and three additions to the line of tools which are now available for use with Nos. 4 and 6 turret lathes are the vertical slide tool, the turret slide support and the multiple cutter head.

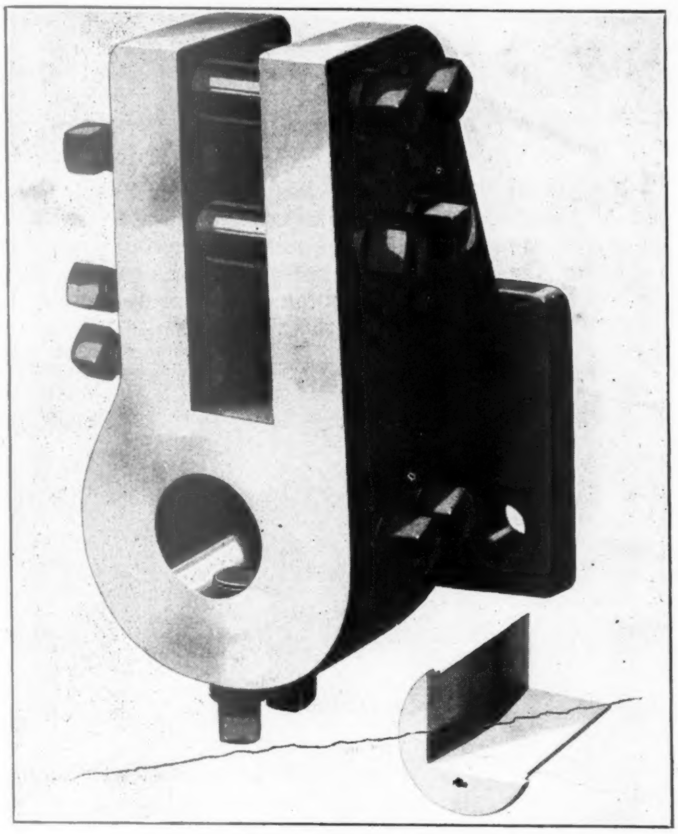


The turret slide support is useful when an extreme overhang of the tool slide is necessary

The vertical slide tool is a rigid turret tool for recessing, back facing, boring, chamfering and similar operations. The slide proper is supplied with a large micrometer dial which assures quick and accurate resetting. The micrometer dial is made very large, so that the large spaces between the graduations allow of easy and accurate resetting. Clips are provided so that they can be placed on any of these indications for resetting purposes. Forged cutters can be easily and quickly set by the use of the split bushing. The two holding set screws at right angles to each other assure proper bearing surfaces for the cutters. By removing the split bushing, boring bars can be used. The vertical slide tool itself is of strong construction and can be used for heavy cuts as well as for cuts of large diameter. A taper gib compensates for wear and increases rigidity; a binder screw rigidly clamps the slide.

The turret slide support is useful when it is necessary to have an extreme overhang of the slide, as is usually required for heavy cuts, interrupted cuts, or on long work where it is not possible to use any kind of piloting. The construction of the turret slide support is such that it is clamped on the bed between the cross slide and the turret unit. It provides extreme rigidity, allows coarser feeding and gives the turret slide additional rigidity when it

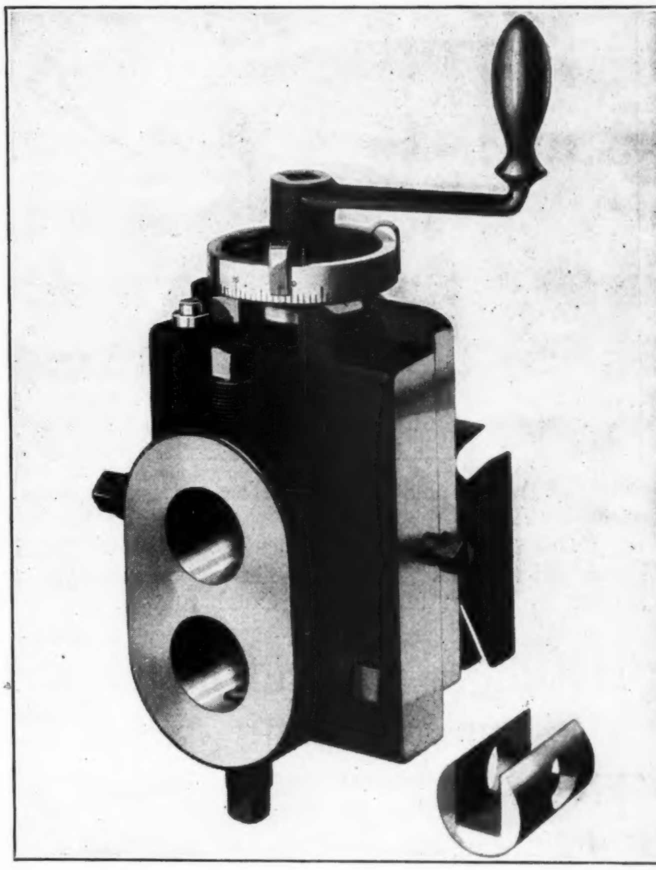
is necessary to have the slide project a considerable distance. It is provided with both vertical and horizontal adjustments which permit accurate setting in relation to the turret slide to compensate for wear. It is extremely



The vertical type mult'ple cutter head is used for boring, turning and facing operations

useful in conjunction with the vertical slide tool previously described when overhead piloting cannot be resorted to, and where the overhang of the turret slide is extreme, because the turret slide support gives the necessary rigidity.

The multiple cutter head is a tool for turning, facing, chamfering and boring operations at the same time that the cross slide is also cutting. The vertical construction avoids interference of the cross slide. Inexpensive forged cutters can be used, and are held in the vertical slide by the various combination of set screws so that each cutter may be set and adjusted independently of each other. The tool is made from a steel casting and is extremely rigid. A series of tie screws and bushings are provided which prevent the sides from springing apart when the forged cutters are clamped in place. These can be shifted to the various holes to allow for any number of positions that are necessary for locating the cutters. A rocker



The vertical slide tool is used for heavy, large diameter cuts

bushing provided for the center hole allows the use of square shanked forged boring cutters. The four holding set screws provided at right angles to each other provide substantial bearing surfaces for holding the cutters.

Biax flexible shaft equipment

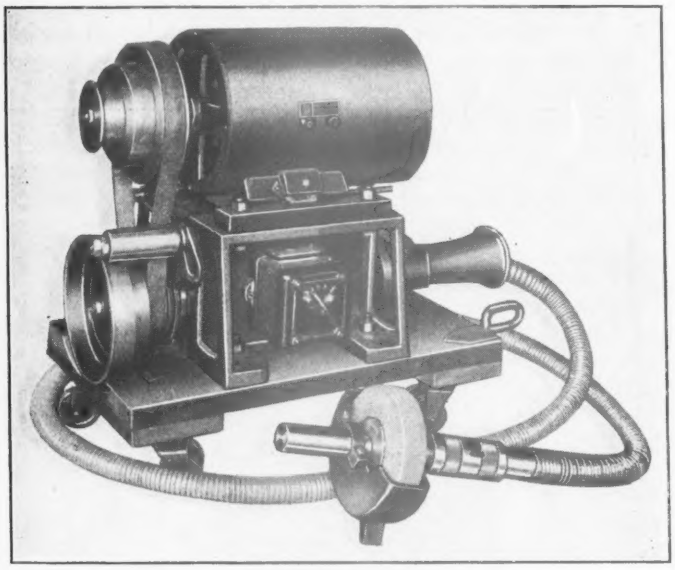
A COMPLETE line of flexible shaft equipment, which includes a variety of driving units and work attachments for all the purposes for which flexible shaft equipment can be used, is being marketed by the Biax Flexible Shaft Company, Inc., New York. The equipment can be employed for grinding, buffing, drilling, bolt setting, die sinking, scratch finishing, polishing, sanding, tube cleaning, casting cleaning and many other operations. The shafts range from .137 to 1.81 in. in diameter and can be furnished with driving units that vary in power from 1/16 to 2½ hp. and in speeds from 1,000 to 4,000 r.p.m.

The illustration shows one of the driving units attached to the shaft and the assembly fitted with one style of the many grinding attachments. In this instance the motor is mounted above the base section and the whole assembly is arranged on a portable platform. The motor can be obtained for either direct or alternating current at 110 or 220 volts, the alternating current being at 60 cycles. The drive is through a set of cone pulleys and belt with a tightener for maintaining the proper belt tension. The starting controller is mounted at the side of the base.

The flexible shaft, which is a special feature of this equipment, consists of an outer casing made of zinc plated steel and is oil tight. Inside this casing is a coil of tempered steel wire, flat in section, to provide strength and flexibility for the casing. At each end of the shaft is a reinforcement mounted outside of the casing to protect the assembly at the points where the greatest strain is imposed. The core consists of a number of coils of special cold-rolled piano wire wound in opposite directions in successive coils. The shaft

is designed to run in but one direction although it can be operated backward with a sacrifice of 20 percent of its transmitting capacity.

Two styles of Biax hand pieces to which the working units are attached are available. Both of these are full ball-bearing design and will run continuously without heat-



Driving unit attached to shaft and grinder

ing. One contains a clutch that is operated by sliding a sleeve in an axial direction. The second hand piece is similar in design but has no clutch and shifter collar.

Headlight for rail motor and multiple unit cars

THE Electric Service Supplies Company, Philadelphia, Pa., has placed on the market a new type of "Golden Glow" headlight with mirrored glass

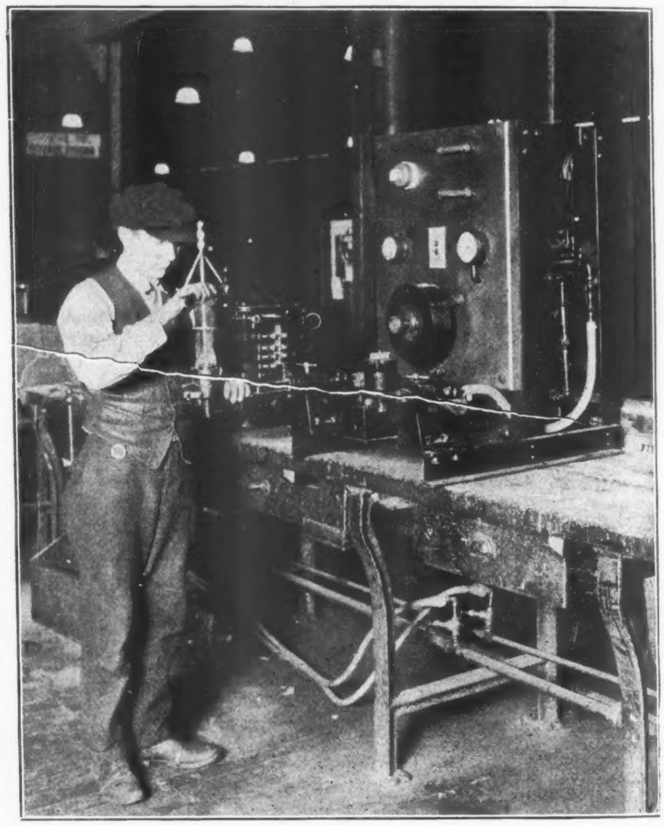
The headlight case is an aluminum casting with bronze fittings

reflector which is especially designed for use on self-propelled rail cars, multiple unit cars and similar passenger equipment. Being designed for installation on the roof of such equipment the body of the headlight is tapered and the feet of the headlight are made so that they will conform to the curvature of the roof.

This new headlight is known as type RA-128. The main body or case is made of one integral cast aluminum shell. Front and side doors also are aluminum and are fitted with gaskets. Fittings are of bronze.

Maintenance outfit for magnet valves

A COMPLETE outfit has been developed by the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., for the thorough and systematic overhaul of electro-pneumatic valves. This equipment permits of accurate adjustments which are prime requisites to proper valve performance in their im-



Maintenance outfit set up with provision for working two valves at once

portant functions in switch groups, reversers, pantagraphs, cam groups, sanders, whistles, etc.

The outfit consists of brackets and adapters for holding the valve while it is being overhauled and undergoing tests, a rheostat for regulating the testing voltage, a testing switch, necessary indicating instruments and pneumatic equipments consisting chiefly of a reducing valve and an air reservoir.

It has been found to be of advantage to the maintenance forces not to assemble this overhauling equipment in any particular ready-to-use manner. For this reason suggestions and diagrams for arranging the outfit in bench form, accompany the equipment.

The outfit is arranged for duplicate operation, in that one valve may be tested while another is being adjusted or the valve seat ground. Provision is made for fastening the valves to the bench in such a way that they can be readily turned to any convenient working position.

PROMOTIONS AND APPOINTMENTS I.C.C. THE SUPPLY TRADE

News of the Month

CLUB AND ASSOCIATION NEWS NEW TRADE PUBLICATIONS NEW SHOPS

The shops of the Pennsylvania at Pitcairn, Pa., were damaged by fire on April 2, to the estimated extent of $150,000. The tin shop and the air-brake shop, with all their machinery, were destroyed, the burned-over area aggregating about 60,000 square feet.

The National Safety Council on April 6 dedicated a bronze memorial in honor of R. C. Richards, one of the founders of the safety-first movement on the railroads of America. The memorial was placed in the waiting room of the Chicago & North Western terminal at Chicago.

The Chicago, Rock Island & Pacific has contracted with the Metropolitan Life Insurance Company of New York for group life insurance for the benefit of all its officers and employees who have been in the service of the company for six months or more. About 30,000 employees are eligible.

Inspection of air brake tests

Air brake tests being conducted in the mechanical engineering building at Purdue University were inspected by the committee on safety appliances of the Mechanical Division of the American Railway Association during the week of April 5. The committee made a complete inspection of the laboratory equipment and reviewed the experimental data which has been compiled to date.

January fuel statistics

Class I railways of the United States in January consumed 9,155,429 tons of fuel coal in the operation of freight and passenger train service, at an average cost of $2.61 per ton, according to the monthly bulletin of railway fuel statistics issued by the Interstate Commerce Commission. In January, 1925, the roads used 9,209,439 tons, at an average cost of $2.81 a ton. The roads also used 180,621,590 gallons of fuel oil, at an average cost of 2.88 cents a gallon, as against 185,217,432 gallons in January, 1925, at an average cost of 2.87 cents. The total cost of coal and fuel oil in January was $29,126,599, as compared with $31,207,876 in January, 1925.

The cost of coal per net ton in January ranged from $1.75 in the Pocahontas region to $4.59 in the New England region.

Extension of time for adjustment of brake power on tank cars

Requests have been received from a number of the owners and operators of tank cars for an extension of the effective date for complying with the provisions of Circular S. III-11, issued May 15, 1919, and the Tank Car Specifications for the adjustment of brake power on existing cars, owing to the fact that so many of the cars have been scattered throughout the country making it difficult for the owners to complete the work in the time limit set, which is July 1, 1926. The General Committee has extended the effective date for complying with the requirements of the Tank Car Specifications in the matter of adjustment of brake power on existing tank cars to July 1, 1927.

A. R. A. Safety Program for June

L. G. Bentley, chairman of the committee on publicity of the Safety Section of the American Railway Association has issued circular No. 119, giving the schedule of safety activities for the month of June, as prescribed at the annual meeting; the two subjects for this month being (1) accidents due to bumping against cars which have been placed for unloading and (2) stepping or tripping on stones, boards, etc. A study of the records shows that men on repair tracks are the most common victims of carelessness under topic No. 1. Consignees and others who are in freight cars, are not properly notified by the men moving the cars. The committee thinks that a great deal of additional work should be done in connection with these two causes.

New equipment

Class I railroads during the first two months this year installed in service 12,817 freight cars, as compared with 28,120 installed during the corresponding period in 1925 and 27,729 in 1924, according to reports filed with the Car Service Division of the American Railway Association.

Of the total, 7,910 were placed in service in February, including 4,303 box cars, 2,845 coal cars and 337 refrigerator cars. Freight cars on order on March 1 totaled 50,947, including 22,140 box cars, 19,753 coal cars and 6,627 refrigerator cars. Class I railroads on March 1 last year had 50,629 freight cars on order, while on March 1, 1924, they had 45,074 freight cars on order. Class I railroads during the first two months this year also installed in service 366 locomotives, as compared with 292 installed during the same period last year and 485 during the same period in 1924. Locomotives placed in service during the month of February totaled 175. Locomotives on order on March 1 this year totaled 441, compared with 293 on the same date last year and 457 on the same date in 1924.

These figures as to freight cars and locomotives include new, rebuilt and leased equipment.

New construction

Cleveland, Cincinnati, Chicago & St. Louis.—The engine terminal to be constructed at Riverside, four miles west of Cincinnati, Ohio, at a cost of approximately $3,000,000, will consist of a 37-stall roundhouse with stalls 125 ft. long, a 100-ft. turntable and accessory buildings, water station, etc. The yard work consists of an extension and rearrangement of the present yards, and relocation of the main tracks. The material for the yard will be obtained by excavation from the engine terminal site.

Meetings and Conventions

Division VI, A. R. A., Purchases and Stores, annual meeting

The seventh annual meeting of Division VI—Purchases and Stores, of the American Railway Association, C. D. Young, chairman; W. J. Farrell (30 Church street, New York), secretary, will be held at Atlantic City, N. J., June 9, 10 and 11, 1926, with headquarters at the Chalfonte-Haddon Hall hotel. The sessions will be held in the Vernon room, Haddon Hall.

The subjects to be discussed are: Stores Department Book of Rules; Classification of Material; Recovery, Repairs and Reclamation of Discarded Material—Classification, Handling and Sale of Scrap; Provisions for Uniform Observance of General Balance Sheet Account 716—Materials and Supplies, and Recommendations Governing Charges to Material Stores Expenses, Paragraph 16—Special Instructions Operating Expenses; Forest Products; Stores Department Buildings and Facilities for Handling Materials; Workable Rules in Connection with the Carrying Out of the Provisions of Section 10 of the Clayton Anti-Trust Act; Supply Train Operation and Line Delivery of Materials; Joint Committee on Fuel Conservation; Materials Purchase Budget; Unit Piling and Numbering of Material; Purchasing Agent's Office Records and Office Organization; Stationery and Printing; General Accounting; Store Delivery of Material to Users at

Shops; Standardization and Simplification of Store Stock and Disposition of Material Reaching Obsolescence; Control of Line Stocks; Uniform Methods Pertaining to Purchases of Equipment and Large Material Contracts and Vital Statistics Relating Thereto, and Sectional Committee on Special Track Work.

Santa Fe stores officers meet

On the Sante Fe it has been the practice for a number of years for the officers of the purchasing and stores department to gather annually in a conference to discuss various problems confronting them and to promote harmony and efficiency within the department and in its dealings with other departments of the system. This year's convention was held on February 17, at San Bernardino, Cal., where extensive improvements of the store facilities have just been completed. The meeting was attended by approximately 200 delegates and visitors. Among those present during the three days' session were John Purcell, mechanical head of the system; H. S. Wall, mechanical superintendent, Coast Lines; A. G. Armstrong, superintendent of shops, San Bernardino; R. S. Belcher, manager timber treating plants system; and A. L. Conrad, assistant general auditor. H. E. Ray, general storekeeper, acted as chairman of the conference and M. J. Collins, general purchasing agent, participated in the discussions.

Safety Section at St. Louis

The Safety Section of the American Railway Association held its annual meeting at St. Louis on April 27, 28 and 29, with an attendance of about 325. At the opening session the meeting was addressed by E. A. Hadley, chief engineer of the Missouri Pacific, who appeared in place of L. W. Baldwin, president of that road, who was unable to attend. R. H. Aishton, president of the American Railway Association, made a brief address, complimenting the Section on its work. Lew R. Palmer, a director of the American Museum of Safety, presented to a representative of the Union Pacific the Harriman gold medal which has been awarded by the Museum to the Union Pacific for its outstanding safety record in the year 1925. Mr. Palmer briefly described the method by which the Museum gathers its data and the rules on which the award of the prize is based.

The election of officers of the Safety Section for the ensuing year resulted in the choice of the following:

Chairman, T. H. Carrow (Penn.); first vice-chairman, L. F. Shedd (C. R. I. & P.); second vice-chairman, P. G. Phillips (Wabash).

A. S. T. M. committees consider railroad subjects

A series of meetings was held on March 17, 18, and 19, 1926, at Providence, R. I., by a number of the committees of the American Society for Testing Materials during which a number of subjects were discussed and action taken directly concerning various departments of railroad work.

Committee A-1 on Steel, F. M. Waring, engineer of tests, Pennsylvania, Altoona, Pa., chairman, voted to refer to letter ballot of its members for adoption as tentative, new specifications for carbon steel rails which agreed with the 1925 specifications for rails of the American Railway Engineering Association with the single exception that the drop test is to be made with the head of the rail up instead of the base. Also, as a result of co-operation with the American Railway Engineering Association, new specifications are being proposed for steel tie plates and soft steel track spikes. The Sub-Committee on Steel Forgings has prepared specifications for high tensile alloy steel forgings, normalized.

Committee A-2 on Wrought Iron, the chairman of which is H. J. Force, chemist and engineer of tests, Delaware, Lackawanna & Western, Scranton, Pa., discussed new specifications for wrought iron pipe to be used for high temperatures and pressures. Arrangements have been made by this committee for conducting a series of physical tests on staybolt iron containing various percentages of phosphorus. Experiments are also being continued on both annealing and unannealing bars, including threaded specimens. All results to date indicate that wrought iron is materially improved by annealing, either in the plain bar or on the threaded bars.

Committee B-1 on Copper Wire reviewed several specifications for copper wire which covered medium hard-drawn wire and hard-drawn wire. A revision of all copper wire specifications is contemplated which will give the unit weight in terms of density rather than specific gravity. It is intended to submit these proposed specifications to the American Engineering Standards Committee, which, if adopted, will make one universal standard for the materials in question throughout the country. It was decided to specify resistivity in the specifications for bronze trolley wire in terms of lb. per mile-ohm in place of the present ohms per meter-gram. This change was made at the suggestion of the American Electric Railway Association.

Committee D-1 on Preservative Coatings for Structural Materials is considering, among a number of subjects, the accelerated weathering of paints and means of designating the color of paint materials. A method of determining elasticity or toughness of less elastic varnishes is not available. The new lacquers are also receiving the attention of this committee.

Committee D-9 on Electrical Insulating Materials has been conducting comparative tests of insulating varnishes, particularly in reference to dielectric strength tests.

Data and information relative to the work being conducted by the American Society for Testing Materials can be obtained from C. L. Warwick, secretary-treasurer, 1315 Spruce street, Philadelphia, Pa.

Fuel Association to hold convention May 11

The International Railway Fuel Association has announced its program for the eighteenth annual convention to be held at the Hotel Sherman, Chicago, May 11 to 14. C. H. Markham, president, Illinois Central, and M. L. Gould, president, National Coal Association, are scheduled for addresses at the first session on Tuesday morning, May 11. The feature of the afternoon session will be an address on Operating Factors in Fuel Conservation, by W. R. Scott, president, Southern Pacific Lines. The program for the second day includes an address on Accounting Factors in Fuel Conservation, by J. J. Ekin, comptroller, Baltimore & Ohio; an address on the Engineering Factors in Fuel Conservation, by H. R. Safford, vice-president, Missouri Pacific System, and an address by R. J. Elliott, purchasing agent, Northern Pacific. C. E. Brooks, chief of motive power, Canadian National Railways, is scheduled to make an address Thursday morning, May 13, on the Mechanical Factors in Fuel Economy. The program follows:

TUESDAY, MAY 11 (OPERATING DAY)

9:30 a.m.—(Daylight saving time.)—Addresses by J. W. Dodge, superintendent fuel conservation; Illinois Central, C. H. Markham, president; Illinois Central, and M. L. Gould, president, National Coal Association.
11:30 a.m.—Co-operation with American Railway Association—Committee report.
12:00 m.—Report of secretary-treasurer.
12:10 p.m.—Appointment of Auditing and other committees.
12:20 p.m.—Unfinished business.
12:30 p.m.—New business.
12:40 p.m.—Adjournment.
2:00 p.m.—Address on Operating Factors in Fuel Conservation, by W. R. Scott, president, Southern Pacific Lines.
2:30 p.m.—Open forum—Operating factors and fuel economy:
(a) Coal.
(b) Oil.
(c) Electric—H. S. Peck, supervisor, locomotive and power plant operation, C. M. & St. P.
4:00 p.m.—Report of Committee on Divisional Fuel Meetings.
5:00 p.m.—Adjournment.

WEDNESDAY, MAY 12 (ACCOUNTING, ENGINEERING AND PURCHASING DAY)

9:00 a.m.—Report of Committee on Fuel Accounting, Distribution and Statistics.
10:00 a.m.—Address on Accounting Factors in Fuel Conservation, by J. J. Ekin, comptroller, B. & O.
10:30 a.m.—Report of Committee on Fuel Stations.
11:30 a.m.—Address on Engineering Factors in Fuel Conservation, by H. R. Safford, vice-president, Missouri Pacific System.
12:00 m.—Open forum—Engineering factors in fuel conservation:
(a) Oil.
(b) Coal.
(c) Electricity—E. T. Howson, western editor, Railway Age.
12:30 p.m.—Adjournment.
2:00 p.m.—Report of Committee on Stationary Plants.
3:00 p.m.—Address by R. J. Elliott, purchasing agent, Northern Pacific.
3:30 p.m.—Report of Committee on Storage of Coal and Fuel Oil.
4:15 p.m.—Report of Committee on Inspection, Preparation and Analysis of Fuel.
5:00 p.m.—Open forum.
5:30 p.m.—Adjournment.

THURSDAY, MAY 13 (MECHANICAL DAY)

9:00 a.m.—Report of Committee on Diesel Locomotives.
10:15 a.m.—Address on Mechanical Factors in Fuel Economy, by C. E. Brooks, chief of motive power, Canadian National Railways.
10:45 a.m.—Report of Committee on New Locomotive Economy Devices.
(a) Coal.
(b) Oil.
Includes discussion of 1925 paper on Back Pressure as an Index to Fuel Economy, by R. W. Retterer, mechanical engineer, C. C. C. & St. L.
12:45 p.m.—Adjournment.
2:00 p.m.—Report of Committee on Firing Practice.
(a) Coal.
(b) Oil.

4:00 p.m.—Open forum—Locomotive operation and fuel economy.
5:25 p.m.—Adjournment.

FRIDAY, MAY 14

9:00 a.m.—Report of Committee on Front Ends, Grates and Ash Pans.
10:30 a.m.—Report of Committee on Constitution and By-Laws.
10:45 a.m.—Reports of Committee on Auditing, Committee on Thanks, and other special committees.
10:55 a.m.—Election of officers.
11:55 a.m.—Balloting for place of 1927 convention.
12:00 m.—Convention adjournment.

The following list gives names of secretaries, dates of next or regular meetings and places of meeting of mechanical associations and railroad clubs.

AIR-BRAKE ASSOCIATION.—F. M. Nellis, Room 3014, 165 Broadway, New York City. Next convention May 4 to 7, inclusive, Hotel Roosevelt, New Orleans, La.

AMERICAN RAILROAD MASTER TINNERS', COPPERSMITHS' AND PIPEFITTERS' ASSOCIATION.—C. Borcherdt, 202 North Hamlin Ave., Chicago.

AMERICAN RAILWAY ASSOCIATION, DIVISION V.—MECHANICAL.—V. R. Hawthorne, 431 South Dearborn St., Chicago. Next meeting June 9-16, inclusive, Young's Million Dollar Pier, Atlantic City, N. J.

DIVISION V.—EQUIPMENT PAINTING SECTION.—V. R. Hawthorne, Chicago. Next meeting September 21-23.

DIVISION VI.—PURCHASE AND STORES.—W. J. Farrell, 30 Vesey St., New York. Next meeting, June 9, 10 and 11, in the Vernon Room of the Haddon Hall Hotel in Atlantic City.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—G. G. Macina, 11402 Calumet Ave., Chicago. Annual convention September 1-3, Hotel Sherman, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. Thirty-ninth St., New York. Railroad Division, Marion B. Richardson, associate editor, *Railway Mechanical Engineer*, 30 Church St., New York.

AMERICAN SOCIETY FOR STEEL TREATING.—W. H. Eiseman, 4600 Prospect Ave., Cleveland, Ohio.

AMERICAN SOCIETY FOR TESTING MATERIALS.—C. L. Warwick, 1315 Spruce St., Philadelphia, Pa. Annual meeting June 21-25, Atlantic City.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Joseph A. Andrucetti, C. & N. W., Room 411, C. & W. Station, Chicago, Ill. Annual meeting October 27-30, Chicago.

CANADIAN RAILWAY CLUB.—C. R. Crook, 129 Charron St., Montreal, Que. Regular meetings second Tuesday in each month, except June, July and August, at Windsor Hotel, Montreal, Que. Next meeting May 11. Annual meeting. Election of officers.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 626 N. Pine Ave., Chicago, Ill. Meeting second Monday in month, except June, July and August, Great Northern Hotel, Chicago, Ill.

CAR FOREMEN'S ASSOCIATION OF ST. LOUIS.—R. E. Giger, 721 North 23rd St., E. St. Louis, Ill. Meetings, first Tuesday in month, except June, July and August, at the American Hotel Annex, St. Louis.

CAR FOREMEN'S CLUB OF LOS ANGELES.—J. W. Krause, 514 East Eighth St., Los Angeles, Cal. Meeting second Friday of each month in the Pacific Electric Club Building, Los Angeles, Cal.

CENTRAL RAILWAY CLUB.—H. D. Vought, 26 Cortlandt St., New York, N. Y. Regular meetings, second Thursday each month, except June, July and August. Hotel Statler, Buffalo, N. Y. Next meeting May 13. Ladies' night. Special entertainment features and a ball masque.

CHIEF INTERCHANGE CAR INSPECTORS' AND CAR FOREMEN'S ASSOCIATION.—A. S. Sternberg, Belt Railway, Clearing Station, Chicago. Convention September 21, 22 and 23, Hotel Sherman, Chicago.

CINCINNATI RAILWAY CLUB.—W. C. Cooder, Union Central Building, Cincinnati, Ohio. Meetings, second Tuesday, February, May, September and November.

CLEVELAND STEAM RAILWAY CLUB.—F. L. Frericks, 14416 Adler Ave., Cleveland, Ohio. Meetings first Monday each month except July, August and September, at Hotel Hollenden, East Sixth and Superior Ave., Cleveland, Ohio. Next meeting May 3. A paper on the reason to have all classes of cars and locomotives equipped with United States safety appliances will be presented by Henry Beriz, assistant general foreman, New York Central, Youngstown, Ohio.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—W. J. Mayer, Michigan Central, 2347 Clark Ave., Detroit, Mich. Next convention August 17-19, Hotel Winton, Cleveland, Ohio.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—J. B. Hutchinson, 1809 Capitol Ave., Omaha, Neb. Next meeting May 11-14, 1926, Hotel Sherman, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—William Hall, 1061 W. Wabash Ave., Winona, Minn.

MASTER BOILERMAKERS' ASSOCIATION.—Harry D. Vought, 26 Cortlandt St., New York. Next meeting May 25-28, 1926, Hotel Statler, Buffalo, N. Y.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meeting second Tuesday in month, except June, July, August and September. Copley-Plaza Hotel, Boston, Mass. Next meeting May 11. Annual banquet and entertainment.

NEW YORK RAILROAD CLUB.—H. D. Vought, 26 Cortlandt St., New York. Meeting third Friday in each month, except June, July and August, at 29 West Thirty-ninth St., New York, May 21. Charles F. Carter will be speaker.

PACIFIC RAILWAY CLUB.—W. S. Wollner, 64 Pine St., San Francisco, Cal. Regular meetings, second Thursday of each month in San Francisco and Oakland, Cal., alternately.

RAILWAY CLUB OF GREENVILLE.—F. D. Castor, clerk, maintenance of way department, Bessemer & Lake Erie, Greenville, Pa. Meeting last Friday of each month, except June, July and August.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 515 Grandview Ave., Pittsburgh, Pa. Regular meeting fourth Thursday in month, except June, July and August. Fort Pitt Hotel, Pittsburgh, Pa.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo. Regular meetings, second Friday in each month, except June, July and August.

SOUTHEASTERN CARMEN'S INTERCHANGE ASSOCIATION.—J. E. Rubley, Southern Railway shops, Atlanta, Ga.

TEXAS CAR FOREMEN'S ASSOCIATION.—A. I. Parish, 106 West Front St., Fort Worth, Tex. Regular meetings, first Tuesday in each month, Terminal Hotel Bldg., Fort Worth, Texas. Next meeting May 4. Regular program.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, 1177 East Ninety-eighth St., Cleveland, Ohio. Annual meeting September 14-17, Hotel Sherman, Chicago.

WESTERN RAILWAY CLUB.—Bruce V. Crandall, 226 W. Jackson Blvd., Chicago. Regular meetings, third Monday in each month, except June, July and August. Next meeting May 17. Annual dinner.

Supply Trade Notes

Hugh Steel, president of the Midwest Car Works, Chicago, died on April 9.

F. O. Bailey, manager of sales of the Gold Car Heating & Lighting Company, New York, died at his home in Brooklyn on April 14.

The Sullivan Machinery Company, Chicago, has appointed the Borchert Ingersoll Company, St. Paul, Minn., its distributors for that state.

The Watson-Stillman Company has removed its main office and sales department from 50 Church street to 75 West street, New York City.

Avery Adams has been appointed assistant general manager of sales of the Trumbull Steel Company, Warren, Ohio, to succeed Arthur Long, resigned.

The Reading Iron Company, Reading, Pa., has appointed T. D. Graham, 850 Euclid avenue, Cleveland, Ohio, as its representative in the Cleveland territory.

Charles S. Orne, president of the Central Steel & Supply Company and purchasing agent of the Streator Car Company, died on April 10, of cerebral hemorrhage.

J. E. Murray, eastern sales manager and eastern export sales manager of the Buda Company, with headquarters at New York, has resigned to engage in other business.

Harold A. Hegeman has been elected first vice-president and treasurer of the National Railway Appliance Company, New York. Mr. Hegeman began his business career with the Ingersoll-Rand Company in its pneumatic hammer department. He left the shop to enter its selling organization and then went to the shops of the New York & Queens County Railway to learn the practical side of electric railroad methods. After serving in the mechanical department and the maintenance-of-way department, he went with the United States Metal & Manufacturing Company as a salesman, and after the liquidation of that company and its railroad interests had been succeeded by the National Railway Appliance Company, he served with the latter company as vice-president and treasurer. He has held this position for the past nine years.

Harold A. Hegeman

Newton E. Dabolt, who for the past six years has been general sales manager in charge of sales for both the lacquer and leather cloth divisions of the Zapon Company, has resigned.

The Milwaukee Crane & Manufacturing Corporation, Milwaukee, Wis., has opened an office in Chicago in charge of Byron B. Evans, formerly district representative at Pittsburgh, Pa.

John W. Guay, sales engineer of the Fort Pitt Steel Casting Company, has been appointed works manager, and H. F. Stratton, formerly in charge of the pattern, mold and core department, is now superintendent.

The Kalamazoo Railway Supply Company, Kalamazoo, Mich., has opened an office at 50 Church street, New York, in charge of J. E. Murray and H. M. Clawson, who will conduct its Eastern domestic and export sales.

J. Reis, vice-president of the United States Steel Corporation at New York, has resigned and will retire from active business. Mr.

Reis was vice-president of the steel corporation from 1911, and previously was assistant to the president.

R. H. Sonnborn has been appointed district manager of the Youngstown Sheet & Tube Company, with headquarters at Detroit, Mich. R. J. Mullaly, formerly superintendent, has been appointed representative, with headquarters at Detroit.

Albert Roberts, formerly sales and service engineer of the Grip Nut Company, Chicago, has been appointed district manager of the southern territory of the Duff Manufacturing Company, with headquarters in the Candler building, Atlanta, Ga.

The Ohio Injector Company, Wadsworth, Ohio, has opened sales offices in Tulsa, Okla., and Ft. Worth, Tex., in charge of V. H. Morgenstern and C. H. Brown, who were formerly associated with the Continental Supply Company, St. Louis, Mo.

Joseph T. Ryerson & Son, Inc., Chicago, has completed arrangements with F. A. Brandes, of the Brandes Machinery Company, Keith building, Cleveland, Ohio, to represent them exclusively for this company's line of metal working machinery and small tools.

George T. Ramsey has been appointed railroad department representative, in the East, of the United Alloy Steel Corporation, Canton, Ohio. Mr. Ramsey will have his headquarters at the company's office in the Pershing Square building, New York City.

C. C. Fredericks, formerly associated with S. F. Bowser & Co., Inc., Ft. Wayne, Ind., has been elected president and general manager of the St. Louis Pump & Equipment Company, St. Louis, Mo. Sherwood Hinds has been elected chief engineer and vice-president.

The Foster Bolt & Nut Manufacturing Company, Cleveland, Ohio, will construct an addition to its plant at Cleveland, following the completion of the addition which it is now constructing. This company has also just placed in operation a new plant at Chicago.

Frank W. Edmunds, president of Craft, Inc., 441 Lexington avenue, New York, has been appointed general eastern sales manager of the Boss Bolt and Nut Works division of the Hoopes & Townsend Corporation, Chicago. Mr. Edmunds began his business career an an office boy, serving, first with John A. Griswold, president of John A. Griswold & Co., who built the Monitor that during the Civil war completely revolutionized the construction of battleships. That company later became the Troy Steel Company and so operated until it liquidated years later. In the meantime, Mr. Edmunds had been promoted to the position of secretary-treasurer and general sales manager. He then became identified with the Q & C company at Chicago as secretary, acting also as western representative of the Pennsylvania Steel Company. Later he became associated with the Dressel Railway Lamp Works of New York, which association he retained for fifteen consecutive years. In June, 1918, he resigned as sales manager of the Dressel Company to become eastern sales manager of the Sunbeam Electric Manufacturing Company, from which position he retired December 31, 1924. Mr. Edmunds served for years on various committees of the Railway Supply Manufacturers' Association and other manufacturing associations connected with the railway supply industry and is now secretary-treasurer of the Signal Appliance Association and secretary of the American Brake Beam Export Association.

F. W. Edmunds

Howard B. Jernee has been appointed sales manager of the line shaft bearing department of the Hyatt Roller Bearing Company, Newark, N. J., succeeding Frank S. Cole. Mr. Jernee was formerly construction engineer for E. I. du Pont de Nemours & Co., and later, works engineer at the Oakland Motor Car Company plant, Pontiac, Mich.

Jos. T. Ryerson & Son, Inc., New York, has taken over the reinforcing bar division of the Penn Metal Company, of Boston, Mass., and will immediately add to the bar sizes and tonnage carried. General sales offices have been opened at 677 Concord avenue, Cambridge, Mass.

The Oliver Electric & Manufacturing Company, St. Louis, Mo., has been merged with the Pyle-National Company, Chicago, the personnel of the Oliver Electric & Manufacturing Company retaining its identity with the Pyle-National Company. The offices of the Oliver Electric Company have been moved to 1334 North Kostner avenue, Chicago.

Andrew C. Loudon, vice-president of the Superheater Company, Ltd., of Montreal, Quebec, died on April 11 of pneumonia, at his home in Burlington, Vt. Mr. Loudon was born at Valley Field, Quebec, on July 7, 1883, and received the degree of B. S. from McGill University in 1906. He took an apprenticeship course with the Canadian Pacific at Montreal, Quebec, and the Grand Trunk at Portland, Me., during 1901 and 1902, and from 1906 to 1907 was in the calculating department of the American Locomotive Company. In 1907 he was appointed enginehouse foreman of the Grand Trunk at Island Point, Vt., and from January to December, 1909, served as machinist and draftsman of the Central Vermont and the Delaware & Hudson at Green Island, N. Y. He then entered the test department of the Atchison, Topeka & Santa Fe, and in 1910 went with the Grand Trunk Pacific, where he served consecutively as construction foreman and foreman of locomotive and car repairs. In 1912 he entered the service of Simmons-Boardman Publishing Company as assistant editor of the Car Builders' Dictionary & Cyclopedia, and later served as associate editor of the Railway Age Gazette, also as associate editor and then as managing editor of the American Engineer and Railroad Journal (now the *Railway Mechanical Engineer*). In 1917 he joined the staff of the Superheater Company, New York, and, in January, 1921, was appointed vice-president of the Superheater Company, Ltd., of Montreal, Quebec. Mr. Loudon was a member of the Engineering Institute of Canada; the American Society of Mechanical Engineers; the Engineers' Club of Montreal, and a number of other social and fraternal organizations.

Andrew C. Loudon

The Midwest Railway Equipment Company, McCormick building, Chicago, has been organized by A. P. Sweeney, formerly assistant to the secretary of the Mechanical Division of the American Railway Association, and L. J. Brown, formerly vice-president of the Illinois Railway Equipment Company, Chicago, to engage in the sale of railway supplies.

Fred A. Poor, president of the P. & M. Company, Chicago, has been elected chairman of the board of directors. P. W. Moore, vice-president, has been elected president, succeeding Mr. Poor. F. A. Preston, vice-president of the P. & M. Company, has been elected also president of the Maintenance Equipment Company, Chicago, succeeding Mr. Poor.

Ross F. Hayes, railway supplies, has removed his office from 2 Rector street to 30 Church street, New York. Mr. Hayes represents the Henry Giessel Company; the railway department at Newburgh, N. Y., of E. I. du Pont de Nemours & Co., Inc.; the D. P. Company, maker of steel dust guards, and the Protecto Manufacturing Company, maker of weather-stripping.

W. E. Frasier, Jr., will work as railroad sales engineer for S. F. Bowser & Co., Inc., Fort Wayne, Ind. Mr. Frasier will have his headquarters at the New York office, 19 West Forty-fourth street. He was formerly employed by the Ellcon Company, New York City, and prior to his employment with the Ellcon Company he was with the Valentine Company.

Harlan A. Pratt has been appointed manager of the oil and gas engine department of the Ingersoll-Rand Company, New York. Mr. Pratt formerly served in the sales department of the Westinghouse Electric & Manufacturing Company, later becoming sales manager of the Atlantic Elevator Company, agents in the east for Westinghouse Gearless Traction Elevators. For the past three years he has been sales manager of the Elevator Supplies Company, Hoboken, N. J.

Clarence Price, formerly with the American Car & Foundry Company as sales agent and later as vice-president, from 1903 until his retirement in 1916, died at his home in New York on April 2. Mr. Price was born on July 28, 1862, in Cincinnati, Ohio, and graduated from Princeton University in 1885. He entered railway service in January, 1900, as purchasing agent of the Chicago & Alton, leaving that position in March, 1903, to go with the American Car & Foundry Company.

L. E. W. Bailey, who for some years past has been railroad sales manager for the Dearborn Chemical Company, Ltd., at Toronto, Canada, has joined the Superheater Company, Ltd., of Montreal, as service engineer. Previous to his connection with the Dearborn company, Mr. Bailey served with the Canadian Pacific and the Great Northern railways, having worked his way up in the motive power department from fireman and engineman to division master mechanic.

Charles Leonard Rowland, engineer, of Carbondale, Pa., died on April 19 at the Post Graduate Hospital, New York. Mr. Rowland was born in Brooklyn, N. Y., on November 28, 1852. He began his career with the Morton Iron Works, Brooklyn. In 1908 he founded the American Welding Company of Carbondale, of which he was president until last February, when the company was merged with the American Car & Foundry Company. During the World War, Mr. Rowland invented a one-ton container for transporting chlorine gas overseas.

Albert Roberts has been appointed district manager of the southern territory of the Duff Manufacturing Company, Pittsburgh, Pa., with office in the Candler building, Atlanta, Ga. Mr. Roberts was formerly associated with the Grip Nut Company, Chicago, Ill., having served in the capacity of sales and service engineer in the southern territory over a period of the last twelve years. Prior to this, he was connected with the mechanical department of the Nashville, Chattanooga & St. Louis. George E. Watts has been appointed special representative of the Duff Manufacturing Company in the southern district, with headquarters as heretofore in the company's office, Candler building, Atlanta.

A new company to be known as Hall-Will, Inc., has been incorporated under the laws of Pennsylvania to manufacture a modern line of pipe, bolt and nipple threading machinery at Pearl and Wagner avenues, Erie, Pa. Leslie Hall, formerly vice-president and general manager of the Williams Tool Corporation, has been elected president of the new company; C. F. Williams, formerly general superintendent of the Williams Tool Corporation and more recently associated with the Erie Steam Shovel Company, which connection he will still continue to hold, has been elected vice-president, and Harry W. Sims has been appointed secretary and treasurer. The directors of the company are G. C. Hay, formerly sales manager of the Williams Tool Corporation; J. W. McLeod, C. A. Rice, and J. H. Sternberger. Mr. Hay also will be sales manager of the new company, and Mr. McLeod, works manager.

The Gould Car Lighting Corporation, a subsidiary of the Gould Coupler Company of Depew, N. Y., has been organized recently in Maryland to take over the car lighting business of the parent company. The new company has bought the plant and equipment of the Lexington Machine Corporation of Rochester, N. Y., which was built originally for the manufacture of automobile and marine engines, and is well adapted for the manufacture of car lighting generators and auxiliary equipment. The officers of the new company are: W. S. Gould, New York, president; J. A. Saur, New York, and Donald S. Barrows, Rochester, vice-presidents; P. P. Meade, Rochester, treasurer, and Bickett Nairn, who was president of the Lexington Company, is secretary and assistant treasurer of the Gould Car Lighting Corporation. W. F. Bouche, at present superintendent of the car lighting department of the Gould Coupler Company at Depew, will be manager of the new corporation, with headquarters at Rochester.

Trade Publications

FLOODLIGHT PROJECTORS.—Bulletin No. 2083, descriptive of short range Imperial floodlight projectors, has been issued by the Crouse-Hinds Company, Syracuse, N. Y.

OKONITE PRODUCTS.—Several four-page folders, descriptive of Okonite tapes, Okocord portable cords and Okonite cement, have been issued by the Okonite Company, Passaic, N. J.

PUMPS AND AIR COMPRESSORS.—Bulletins Nos. 207 and 127, descriptive of multi-stage centrifugal pumps and direct-connected synchronous motor-driven air compressors, respectively, have been issued by the Pennsylvania Pump and Compressor Company, Easton, Pa.

REFRACTORY GUN.—The use of the Quigley refractory gun for the quick repair and maintenance of furnace linings, including hot patching and surface coating, is described in a 14-page illustrated booklet issued by the Quigley Furnace Specialties Company, 26 Cortlandt street, New York.

WATER METERS.—The value of the water meter for distribution lines, pump operation, filtration plants, hydro-electric plants, etc., is discussed in a 16-page bulletin, No. W-31, descriptive of Republic water meters, which has been issued by the Republic Flow Meters Company, 2240 Diversey Parkway, Chicago.

CERTIFIED MALLEABLE IRON.—Bulletins Nos. 50, 51, 52 and 53, the first four of a series of industrial bulletins, containing pertinent facts about certified malleable iron which every user of metals should know, are being distributed by the American Malleable Castings Association, Union Trust building, Cleveland, Ohio.

PNEUMATIC TOOLS.—Catalogue No. 15, descriptive of Thor pneumatic tools, including accessories, busters, drills, grinders, hammers, hoists, holders-on, etc., has been issued by the Independent Pneumatic Tool Company, 600 West Jackson boulevard, Chicago, Ill. Instructions for the maintenance and ordering of pneumatic tools and their weights and dimensions packed for export are given in the catalogue, also illustrations showing the use of the tools in building cars and locomotives, in building ships, in boiler shops, foundries, machine shops and steel mills, etc.

PAINT PIGMENT.—A 26-page research bulletin descriptive of metallic zinc powder as a paint pigment has been issued by the New Jersey Zinc Company, 160 Front street, New York. Metallic zinc powder, also known as Zinc dust, is not a by-product made in the smelting of zinc ores, but is distilled in furnaces especially designed and operated for its sole production. The primary purpose of the bulletin is to present the practical information and formulas already obtained by test so that known and tried paints may be made up by those interested and further experiments inaugurated.

THREAD STANDARDIZATION.—In co-operation with the Department of Commerce, Division of Simplified Practice, and the National Thread Commission, appointed by Congress, the Eastern Machine Screw Corporation, New Haven, Conn., has compiled tables listing those thread sizes considered standard and for which chasers are stockable, and is distributing them in folder form for purchasing departments, engineering departments, stores departments, etc. A new catalogue of H. & G. self-opening die heads has also been issued by the Eastern Machine Screw Corporation, in the appendix of which a number of pages from the report of the National Thread Commission have been reprinted.

CHUCK WORK.—This is the second of a series of booklets being prepared by the Warner & Swasey Company, Cleveland, Ohio, on modern tooling methods for turret lathes. The problems of chucking work are discussed in much the same manner that the problems of bar work were treated in a previous booklet. The design, selection and use of Universal chucking tools is fully covered and chapters are devoted to the practical application of these tools to typical chucking set-ups and a discussion of the operations involved. The third booklet of the series will also deal with chuck work. Further examples of chuck tooling will be given and the individual tools will be described in greater detail.

Personal Mention

General

Irving C. Blodgett has been appointed assistant to the mechanical superintendent of the Boston & Maine, with headquarters at Boston, Mass., succeeding Frank H. Becherer, resigned.

L. A. Richardson has been promoted to general superintendent of motive power of the Chicago, Rock Island & Pacific, with headquarters at Chicago, succeeding W. J. Tollerton, deceased. Mr. Richardson was born at Bucklin, Mo., in 1868, and entered railway service in 1884 as a machinist apprentice on the Union Pacific at St. Joseph, Mo., later being promoted to roundhouse foreman and then to general foreman at the same place. After being transferred to the Oregon Short Line for a short time he entered the service of the Rock Island in 1906 as master mechanic, with headquarters at Trenton, Mo. Mr. Richardson was transferred to Chicago in 1910, where he remained until 1913, when he was promoted to mechanical superintendent, with headquarters at El Reno, Okla. He was transferred to the First district, with headquarters at Des Moines, Ia., in 1916, later being promoted to superintendent of motive power, with the same headquarters. He continued in that capacity until his recent promotion to general superintendent of motive power.

L. A. Richardson

T. W. McCarthy has been promoted to superintendent of motive power of the Chicago, Rock Island & Pacific, with headquarters at Des Moines, Iowa, succeeding L. A. Richardson. Mr. McCarthy was born on April 27, 1862, at Dunkirk, N. Y., and entered railway service about 1883 in the mechanical department of the Union Pacific. Previously he had served an apprenticeship with the Brooks Locomotive Works and the Dunkirk Engineering Works. Beginning railway service, he was employed as a machinist, later being promoted to gang foreman, night roundhouse foreman and general foreman. After several years' service with the Wheeling & Lake Erie and the Wabash, he was appointed general foreman on the Chicago, Rock Island & Pacific at Shawnee, Okla., in 1906. He was later promoted to master mechanic of the Arkansas division, being transferred later to the Panhandle-Indian Territory division, and still later to the Kansas division. In September, 1923, he was transferred to the Cedar Rapids-Minnesota division, with headquarters at Cedar Rapids, Iowa, where he remained until his recent promotion to superintendent of motive power.

T. W. McCarthy

W. H. Fetner, chief mechanical officer of the Missouri Pacific, with headquarters at St. Louis, Mo., has been appointed also chief mechanical officer of the Gulf Coast Lines and the International-Great Northern.

F. G. Lister, master car repairer of the Southern Pacific, with headquarters at El Paso, Tex., has been appointed chief mechanical engineer of the St. Louis-San Francisco, with headquarters at Springfield, Mo., to succeed A. H. Oelkers, resigned.

Master Mechanics and Road Foremen

F. M. Clark has been appointed road foreman of engines of the Charlotte Harbor & Northern, with headquarters at Arcadia, Fla.

G. E. Sisco has been appointed assistant master mechanic of the Fort Wayne division of the Pennsylvania, with headquarters at Fort Wayne, Ind.

B. H. Smith, master mechanic of the Chicago, Rock Island & Pacific, with headquarters at Estherville, Iowa, has been transferred to Horton, Kan., succeeding G. W. Cuyler.

G. W. Cuyler, master mechanic of the Chicago, Rock Island & Pacific, with headquarters at Horton, Kan., has been transferred to Des Moines, Iowa, succeeding T. W. McCarthy.

E. L. Bachman, assistant master mechanic of the Panhandle division of the Pennsylvania with headquarters at Cully, Pa., has been promoted to master mechanic of the Wheeling division, with headquarters at Mingo Junction, Ohio.

Car Department

George Oliver, for the past eight years chief clerk to the master car builder of the Belt Railway of Chicago, has been appointed general car foreman of the Fort Street Union Depot Company, with headquarters at Detroit, Mich.

Frank H. Becherer has resigned as assistant to the mechanical superintendent of the Boston & Maine to become superintendent of the car department of the Central of New Jersey. A sketch of Mr. Becherer's railroad career appeared in August, 1925, issue of the *Railway Mechanical Engineer*, page 537.

Shop and Enginehouse

Frederic E. Lyford, supervisor of apprentices of the Lehigh Valley at Sayre, Pa., has been promoted to assistant general machine shop foreman, with headquarters at Sayre.

W. P. Bickley, machine shop foreman of the Buffalo division of the Pennsylvania, has been appointed general foreman, locomotive repair shop, Eastern division, with headquarters at Canton, Ohio.

Purchases and Stores

Lee F. Blood has been appointed purchasing agent of the Green Bay & Western, succeeding H. E. Dutton, deceased.

Thurman A. Stinson has been appointed storekeeper of the Green Bay & Western, succeeding E. C. Juley, deceased.

W. F. Vogt has been transferred from Altoona, Pa., to Philadelphia as assistant general storekeeper of the Pennsylvania.

O. V. Daniels, assistant general storekeeper of the Pennsylvania, at Philadelphia, Pa., has been appointed general storekeeper, with headquarters at Altoona, Pa., succeeding W. F. Vogt.

E. T. Campbell and E. Curtis have been appointed division storekeepers on the Chesapeake & Ohio, with headquarters respectively at Russell, Ky., and Ashland, Ky. R. H. Rutman has been appointed assistant division storekeeper, with headquarters at Russell.

J. L. Cowan, tie and timber agent of the Southern Pacific lines in Texas and Louisiana, and formerly purchasing agent of the San Antonio & Aransas Pass, has been promoted to assistant purchasing agent of the lines in Texas and Louisiana, with headquarters at Houston, Tex.

Obituary

Ernest C. Juley, general storekeeper of the Green Bay & Western, died on March 5, after a short illness.